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People as pedestrians

J E Todd
A Walker

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OFFICE OF POPULATION CENSUSES AND SURVEYS
SOCIAL SURVEY DIVISION

People as pedestrians

A survey to ascertain how much
adults go out and about on foot-
carried out on behalf of the
Transport and Road Research Laboratory

J E Todd
A Walker

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But, of course, there would have been no report at all were it not for the co-operation of the people selected to take part in the survey to whom we extend our grateful thanks.

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1 Introduction

1.1 Background and purpose

Most people are pedestrians but very little basic information quantifying pedestrian movement exists and as planners become more aware of the needs of people as pedestrians the lack of basic data becomes more apparent. This survey, commissioned by the Transport and Road Research Laboratory was designed to fulfill this need and was carried out by the Social Survey Division of the Office of Population Censuses and Surveys.

A large number of travel surveys are carried out, some local and some national but these mainly concentrate on vehicle travel. The National Travel Survey provides a comprehensive study of the travelling habits of the population but, in doing so, it can only look at each type of travel using the same broad measures. Thus whereas mileage can be measured quite accurately for vehicles this is not so for pedestrians. (We discuss in more detail at the end of Chapter 2 the factors which lead to the results from the National Travel Survey and this survey not being directly comparable.)

Patterns of pedestrian behaviour and the incidence and type of pedestrian accidents vary considerably between children and adults so they are generally studied separately. In this investigation the Transport and Road Research Laboratory (TRRL) were interested in adults and, in particular, comparisons between the elderly and other adults (a factor which made a major contribution to the sample design). The coverage of this survey was thus confined to persons aged eighteen and over in Great Britain. (See Section 1.4.)

As well as presenting basic descriptive material about the patterns of pedestrian behaviour we also used the survey data to investigate the relationships between pedestrian 'exposure' (ie the amount people go out and about on foot) and the numbers of pedestrian accidents.

Every year statistics of road accidents and the people involved in them are compiled from reports submitted by the police to the Department of Transport, the Welsh Office and to the Scottish Development Department. These reports give a standard range of information for all accidents involving personal injury. They contain information about the casualties themselves, such as age, sex and whether they were pedestrians, drivers or passengers; the vehicles involved (type, defects, manoeuvres and so on); and the attendant circumstances including the road layout and class, the date and time and whether it was light or dark. TRRL thus regularly has access to a great deal of detailed information about pedestrian casualties but as we have said, no comparable data is regularly available about pedestrian activity, thus a specially designed survey to provide such information was commissioned.

The combination of the accident statistics and the data we have collected in this survey allows certain measures of the risk of being involved in a pedestrian accident to be calculated. There was also especial interest in any relationship that might be found between a measure of pedestrian exposure and the large variation seen with age in the annual pedestrian casualty rates. In 1975, for example, the pedestrian casualty rate for people aged sixty and over was 122 per 100,000 people as compared to only 83 per 100,000 for adults aged fifteen to fifty-nine.

Figure 1.1 shows for six age groups the number of male and female pedestrians injured in 1975 per 100,000 people in the population. Looking at the two sexes we can see that for every age group more males than females per 100,000 people were injured in pedestrian accidents. However, this difference is somewhat overshadowed by that which occurs with age. Among the adults in the middle age ranges the casualty rate varies only slightly between the age groups but for the sixty year olds and over the rate increases sharply with age.

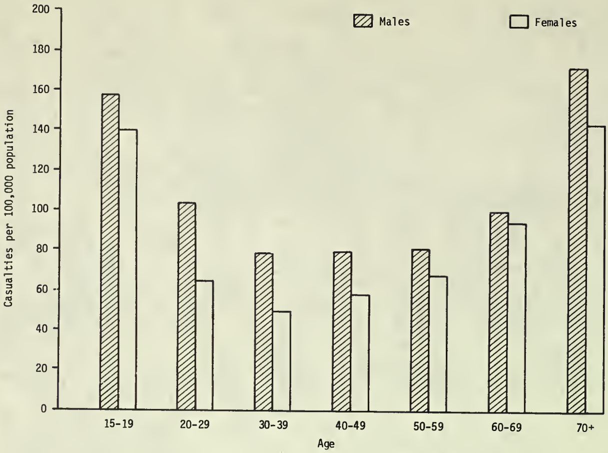
The pedestrian casualty rates as calculated above show that per head of population old people have much greater likelihood of being involved in a pedestrian accident. However these relationships might be very different if the amount of walking done by the population were taken into account, since it seems likely that the amount of walking done might also vary with age.

It has been suggested that as older people have more free time and fewer of them hold driving licences then as a group, they might do more walking than younger adults. If this were so then a measure which used population figures alone in the denominator would give an over estimate of risk. However, it is also true that older people suffer more often from physical disabilities and, as a group, more of them have difficulty going out at all which would mean that the measure of risk as calculated previously might be an underestimate. Clearly, a direct measurement of pedestrian exposure is required in order to establish the net effect of these factors.

1.2 Outline of the methodology

The inquiry was divided into two parts. The first consisted of an interview in the home and the second the collection of detailed road information using interviewers as observers. A general population sample of named persons was selected from the electoral register and a

Figure 1.1 Pedestrian casualties per 100,000 people in the population (1975)



doorstep sampling technique was used to weight the sample in favour of the elderly. The inverviewers made contact with the named individuals, established if they were eligible and, if they were, made arrangements to interview them.

From the interview we obtained information about all the journeys the named person had made on a preselected sample day (see Section 1.7) and in particular exact details of where he had gone on foot. We also asked about his attitudes and habits as a pedestrian. When this information had been collected, the interviewer, using the detailed descriptions obtained during the interview, had to rewalk all the walking parts of the journeys mentioned by the informant and complete observation sheets about all the roads that were crossed (see Section 2.2).

As we intended to use this rather novel method of collecting the detailed information a feasibility study was carried out at the very initial stages of the planning. In this we tested to see (a) whether the interviewer could obtain enough information in the interview to be able to rewalk the routes and (b) whether the interviewer could retrace routes taken down by somebody else. This small study proved that in these respects the method was viable and a pilot study was carried out in June 1975. Following a few minor alterations the main fieldwork took place in the September and October of that year. The Transport and Road Research Laboratory prepared accident figures for the same period so that these could be used in the analysis.

1.3 The sample design

In all sample surveys two conflicting requirements have to be taken into account. The first is that interviews need to be geographically spread for an efficient sample and the other is that interviews need to be reasonably close together for efficiency of the interviewer. These two points were particularly important in this survey because too clustered a sample would have meant that people had all walked in the same area and yet the interviewer needed a fairly clustered sample to be able to complete the necessary observations for one informant whilst making contact with and interviewing others.

These reasons led to the choice of a three stage sample using new County Districts as the first stage, wards as the second and named persons as the third. Eighty districts were selected with four wards taken from each and sixteen people selected from each ward. This gave a total sample size of 5120.

The County Districts were selected with probability proportionate to the electorate after the frame had been stratified by the following five factors: region, an economic indicator, population density, car ownership and age distribution. The Highlands and Islands of Scotland were excluded from the frame.

The named person sample was selected from the electoral register. Although the electoral register is the most comprehensive list of names and addresses available for use as a sampling frame it obviously does not include every person who is at risk of being involved in a pedestrian accident. It does not, for example, include foreign visitors who would not be eligible for inclusion on the electoral register, nor, of course, those people who although eligible have not, for one reason or another been put on the register. We did, however, include people who were resident in institutions, provided of course that they were found on the electoral register. Thus any person whose name was on the electoral register had a chance of selection for this survey.

1.4 Age coverage

The study was designed to cover adults, with especial interest in the elderly. We have seen in Figure 1.1 that the pedestrian casualty rate for 1975 starts to increase sharply for those people aged sixty or more, so, for the purposes of this survey, we have defined the elderly as being aged sixty and over.

In the presentation of road accident statistics adults are defined as aged fifteen or more, and we originally intended to include fifteen year olds and upwards in the survey. However, the use of the electoral register as a sampling frame meant that an extra sampling procedure would have been needed to select a sample of fifteen to seventeen year olds. As we were already putting a heavy load on the interviewers in terms of the observation requirements we decided that additional sampling procedures might complicate the project too much. For this reason adults were defined as being eighteen or over.

As the elderly were of particular interest it was important to have a large enough sample of the over sixties for the analysis stage. The sixty year olds and over constitute approximately a quarter of the adult population and so a general population sample which had an adequate number of elderly people would contain more younger adults than were strictly necessary. This would be wasteful of resources so it was decided to randomly reject a proportion of the younger adults.

The electoral register contains no information about age so initially a sample was selected which would give an adequate number of people aged sixty or more. Then all electors who were found to be sixty or more were interviewed but only one in two of the under sixties had a full interview. The division between younger adults who were to be interviewed and those who were not was made using the serial number. All those with even serial numbers were to be treated as eligible for interview whereas those with odd serial numbers were only eligible if they were aged fifty or over. The age limit for the sub-sample was taken at fifty rather than sixty for two reasons. First, it enabled a better decision to be made about eligibility in borderline cases and second it provided an opportunity to obtain some information about the characteristics of the rejected sample in order to check that no biases had been introduced. The fifty to fifty nine year olds with odd serial numbers were given only a short interview which stopped before the details of the sample day were collected while their counterparts, the fifty to fifty nine year olds with an even serial number, were, of course, eligible for a full interview.

1.5 Fieldwork period

A major objective of the survey was to measure pedestrian exposure and compare it with the accident statistics. Most of the accident figures are presented on a yearly basis so, ideally, the exposure measures should have covered a year but considerations of the cost, time and quality of the data prevented this. The accident statistics show a monthly variation so in order to obtain a true comparison between them and exposure we needed the statistics for the month of the year in which the fieldwork was carried out.

Generally, the fieldwork for a survey of this size would last for about a month but in one month there are comparatively few pedestrian accidents, a fact which would have limited us at the analysis stage. For this reason the fieldwork was spread over two months, and TRRL agreed to make available the accident figures for the same period.

As we have said, the fieldwork was planned to take place in September and October of 1975. British Summer Time comes to an end in October so in order to avoid confusion over times of day and light and dark evenings the last sample day was set at 25th October, the last day of British Summer Time.

Each interviewer was allotted one of the eighty districts as her quota. In order to spread the sample over the eight weeks of fieldwork each of the four wards selected within the district was given a specific date before which interviewing could not start. The idea being that there were two weeks for interviewing to take place in each particular ward.

1.6 Selection of sample days

In any travel survey there are two main methods through which the information can be obtained: retrospectively or by record keeping. Both of these methods have their disadvantages some of which are general while others were particular to this survey. One particular difficulty on this survey arose because we were mainly interested in the amount of walking done by the informants and the easiest way to record this is to include the other parts of journeys as well. This would have led to asking the informant either to record some parts of the journey in much greater detail than others or to record the whole journey in the depth of detail we needed for the walking parts. To ask for the latter alternative would have severely strained the goodwill of our informants and we felt the former might prove too difficult to explain; however, it could be efficiently tackled by an interviewer. This led to the choice of the retrospective method of collecting the information.

We have tried to reduce the memory problem by limiting the time period between the interview and the day to be described and by using observation techniques for the very detailed information needed.

We felt that we could collect information about one day only to prevent the interview becoming unacceptably long, so this day had to be preselected to prevent interviewer bias. Accident statistics over several years showed a marked variation in the numbers of accidents at different times of day with peaks generally around the rush hours and late at night. The distribution, however, was not constant for the different days of the week. For Monday to Thursday there was very little variation in the distribution of accidents throughout the day but Friday, Saturday and Sunday were all very different, with the early evening peak being an hour earlier for Friday than for Monday to Thursday and disappearing altogether for Saturday and Sunday. There was also a very large increase in the number of accidents late at night on a Saturday. These differences meant that for analysis purposes Monday to Thursday could be grouped together but that Friday, Saturday and Sunday all need to be looked at separately, and so more weekend days had to be selected than weekdays (taking Friday as a weekend day).

As we have said, in order to reduce the memory problem the interviewers were asked to interview on the day after the relevant sample day in as many cases as possible. Where this was not possible they were allowed to interview up to four days after the sample day but no more. The preselected sample days were identified only by the day of the week not by specific dates so in cases where the informant suggested a day for interview more than four days after the sample day the interviewer postponed the interview and tried again for the following week.

The fact that there were more weekend days than weekdays combined with the four day gap restriction meant that achieving all the interviews for people with Friday, Saturday or Sunday as their sample day would be quite difficult. For this reason Monday was never used as a sample day and this gave the interviewers both Monday and Tuesday each week to catch up on all their weekend interviews. Thus Tuesday, Wednesday and Thursday were taken as representative of Monday to Thursday. The days were allotted to the informants by using a randomised cycle of weekday, Friday, Saturday and Sunday.

1.7 Weighting of the data

The design of the sample necessitated the weighting of the data at the analysis stage. All informants under sixty years of age carried a weight of two because one in two of the initial sample of people under sixty had been rejected. The days of the week also had to be weighted to be combined in the correct proportions for a week with all weekdays being given a weight of four and all weekend days a weight of one.

The age weighting needs to be taken into account throughout the analysis but the day of the week weighting is only strictly necessary for looking at exposure measures. Thus it need not be used in the analysis of variables relating directly to the informant and not to exposure. However, the varying use of weights can lead to confusion because it causes the size of the bases to vary, so it is more straightforward to use both weights all of the time. This is only statistically correct if the main variables are evenly distributed between the different types of sample days. Table 1.1 shows the distribution of age and sex for the four types of sample day.

Table 1.1 Distribution of age and sex by sample day

	Sample day			
	Tue*-Thur	Friday	Saturday	Sunday
	%	%	%	%
Sex				
Male	46	46	43	48
Female	54	54	57	52
	100	100	100	100
	%	%	%	%
Age				
18-29	16	16	16	18
30-39	13	13	14	13
40-49	13	14	12	14
50-59	16	13	15	13
60-69	23	23	23	23
70-79	14	15	14	14
80 and over	5	6	6	5
	100	100	100	100
Base	*635*	*661*	*661*	*664*

As we can see from the table the distributions are very similar for all four types of sample day and significance tests confirm that the data show no differences in the distribution of age and sex between the sample days. This means that weighting the data by weights which take into account the informant's sample day will make no difference to the overall analysis of subjects not related to exposure, so for ease of handling the data both weights have been used throughout the analysis. Thus all informants aged less than sixty with Tuesday*, Wednesday or Thursday as a sample day carry a weight of eight, those aged sixty or more with the same sample days carry a weight of four. Informants aged less than sixty and with Friday, Saturday or Sunday as a sample day have a weight of two while informants aged sixty or more with those sample days carry a weight of one.

1.8 Sampling errors

The results presented in this report came from a sample design which was three stage, stratified and not self weighting. Each of these three elements means it is not possible to calculate the sampling error of the mean using the formula based on a simple random sample. There are, however, formulae which are based on assumptions which take into account stratification, clustering and weighting. One of these is presented in Appendix A. Sampling errors for the main variables have been calculated using this formula and they are presented in the Appendix with the appropriate mean. Appendix A also contains a more detailed description of the stratification and some validation of the sample itself.

1.9 The response

The design of the sample, however good it might be, is of

**See final paragraph of 1.6*

little consequence if a good response rate is not achieved. We now go on to look at the response rates achieved in this survey and then at how these affected the overall exposure measures.

The original named person sample of the survey divided into four main groups of people at the interview stage. First there were those who were ineligible because they had died or emigrated; second were those who were ineligible as defined in our sample design, ie they were aged less than fifty and had odd serial numbers (see Section 1.4); third were those who were eligible for interview but with whom an interview was not achieved and fourth were the people who were interviewed.

For the reasons we stated in Section 1.4 people with odd serial numbers aged between fifty and fifty nine were only given a short interview. Thus from the analysis point of view these people were to be excluded but for fieldwork purposes they were eligible. We have therefore included them in the eligible category in Table 1.2 but when we go on to look at the non-response in more detail they have been excluded.

When a sample design is such that people are ineligible through a random process there can be confusion over the differences between those who were non-responders and those who were ineligible. In this survey we asked the interviewers to find out as much classificatory information as possible about all non-responders, and if they were found to be ineligible through age (ie less than fifty with an odd serial number) they were immediately put into the ineligible category rather than the non-response. Thus we hope that all people in the non-response group are those who were in fact eligible for interview. Obviously there will be some people about whom the interviewer obtained no information who therefore could be wrongly classified. We have investigated the non-response distributions in detail and the results are presented in Appendix B.

Table 1.2 shows the distribution of the original named person sample and the cooperation achieved amongst the eligible sample. We selected an initial sample of 5120 people of whom 3505 were found to be eligible for interview. There were 1411 people who were ineligible because of the sample design, ie they were aged less than fifty and had an odd serial number. This figure agrees well with the estimate of 1442 people in this category made from the age distribution of the population for 1975. Amongst the others included in the ineligible group were four electors' numbers which had no name attached to them and some seventeen year olds who would have been eighteen in the life of the register but were not at the time of the fieldwork.

We achieved interviews with 85% of the eligible sample. Of these, 358 were with people aged fifty to fifty nine with an odd serial number who were only given short interviews as we explained previously. Again this figure agreed with the estimate made from population figures. The 'non-contact' category includes those people who were away for the whole of the fieldwork period, those who had moved leaving no forwarding address and those who were out at all calls to the address. In most cases where people had moved the new address was ascertained and the sampled person could be traced. This sometimes involved reallocating the interview to another interviewer who was working in the relevant area. The 'others' category includes those cases where there was no interviewer available to do the interview. Work also had to be reallocated when informants had done some walking on their sample day away from their home but in all cases where this was necessary the walks were successfully reallocated.

Table 1.2 Response rates

		No.	%	
a) Distribution of named person sample				
Eligible		3505	69	
Ineligible	Dead/emigrated	124		
	Odd serial no. and age less than 50	1411	30	
	Others	16		
Withdrawn+		64	1	
Total sample		5120	100	
b) Cooperation achieved				
Interview		2621	75	85%
Short interview*		358	10	
Refusal		283	8	
Non contact		217	6	
Others		26	1	
Total eligible sample		3505	100	

+ *Due to unforseen circumstances the sample in one first stage unit could not be interviewed.*

* *People with odd serial numbers aged 50-59 (see Section 1.4).*

1.10 Characteristics of the non-response

The characteristics of the non-response are important in all surveys as an unbalanced loss of the sample causes a bias in the results. In this particular survey it seemed likely that the non-response might affect the overall measures since some of the reasons for non-response could be connected with the main purpose of the survey. For example, an informant who could not be contacted because he was always out could possibly have a high pedestrian exposure whereas some of those who were classified as 'away all survey period' were in fact out of the country or were away in hospital so both would have had zero pedestrian exposure as defined in our terms.

However, it is of course difficult for the interviewer to obtain detailed information about the people who do not take part in a survey. If the interviewer cannot contact the sampled person then she may speak to other people in the household, neighbours, or no one at all. If the named person has declined to co-operate in the survey then it is very difficult to obtain the information one would like without creating bad feeling.

With all these problems in mind we asked the interviewers to try to establish just a few items of classification information and whether or not the non-respondent had been out at all in the last month. Ideally of course we would have preferred more detail about pedestrian activity that would have given us some idea of how much the person had been out but for the reasons above this was not possible.

This basic amount of data does allow us to make an adjustment to take account of the non-response in terms of the proportion of people who do not go out and therefore have zero pedestrian exposure, but it does not allow us to adjust for any non-respondents whom we did not contact because they were out a lot and who, possibly, had a much higher than average level of pedestrian exposure.

Since we only have very little data about the non-respondents we cannot make adjustments to the detailed survey results for the effect of non-response although we can have a look at the overall effect of non-response on the proportion of people who do not go out. A detailed description of the method of calculation will be found in Appendix B, just a broad outline will be given here.

1.11 Method of estimating a measure of pedestrian activity for the non-respondents

The method used to make this estimate needed to take account of various features of the overall survey design. As has been described earlier only one in two of younger adults were interviewed. This means that we needed an estimate of the age (whether under or over 60) of all the non-respondents in order to include them with the appropriate weight. For those non-respondents for whom no estimate of age had been ascertained some decision as to age group had to be made. Similarly, a decision had to be made on how to group the non-respondents for whom we had no information concerning whether or not they had been out in the last month.

Two methods were used in deciding how to allot the non-respondents for whom we had no information about whether they had gone out in the last month. The first was based on the simple assumption that those for whom we had no such information would be distributed similarly to those for whom we had. The second method took more account of the reasons for the non-response.

The first method was used to produce exposure estimates for the two main age groups and the two sexes as well as for all the eligible sample while the second, being more complicated, could only be used to produce an overall estimate. It is this latter estimate however which we feel is likely to be the more reliable.

The information available from the people who had taken part in the survey was of course much more extensive but the question which was most closely related to the information that we had for the non-respondents was 'Have you been out at all in the last week?' and this was the one used to compare the response and non-response parts of the sample. Table 1.4 shows the estimates based on the simple assumption while Table 1.5 shows those based on the more complex one.

Table 1.4 Estimates of pedestrian activity for total eligible sample using the non-response 'simple' estimate

Measure of activity	Interview results (a)	Non-response estimate (b)	Combined response & non-response figure (c)
Total sample	%	%	%
Goes out	97	81	94
Not	3	19	6
	100	100	100
Weighted base	*7120*	*1435*	*8555*
People aged 18-59	%	%	%
Goes out	99	86	97
Not	1	14	3
	100	100	100
Weighted base	*5188*	*1044*	*6232*
People aged 60 and over	%	%	%
Goes out	92	66	88
Not	8	34	12
	100	100	100
Weighted base	*1932*	*391*	*2323*
Male	%	%	%
Goes out	98	81	96
Not	2	19	4
	100	100	100
Weighted base	*3339*	*669*	*4008*
Female	%	%	%
Goes out	96	81	94
Not	4	19	6
	100	100	100
Weighted base	*3781*	*766*	*4547*

Column (a) in Table 1.4 shows the distribution of the answers given by the respondents to the question 'Have you been out at all in the last week?' Among the respondents 97% said they had been out and 3% said they had not. Among the non-respondents the estimates showed a lower level of exposure (Column (b)) although it was still generally the case that the large majority of people (81%) were said to have been out in the last month. Combining these two estimates produced an exposure measure for the whole sample (Column (c)) which, as we expected, was slightly lower than the figure obtained from the interview (94% compared with 97%). The largest difference was seen among the elderly for whom 92% of the respondents were said to have gone out whereas only 66% of the elderly non-respondents were estimated to have gone out. However, the group of elderly non-respondents was relatively small and consequently when the two groups were amalgamated to give an estimate for the population as a whole the proportion of the elderly who were estimated to go out was only reduced to 88%.

Table 1.5 Estimates of pedestrian activity for total eligible sample using the non-response 'complex' estimate

Measure of activity	Interview results (a)	Non-response estimate (b)	Combined response & non-response figure (c)
	%	%	%
Total sample			
Goes out	97	85	95
Not	3	15	5
	100	100	100
Base	*7120*	*1435*	*8555*

Table 1.5 gives results equivalent to the first section of Table 1.4 but using estimates based on the more complex procedure. Once again the estimate is lower than the interview results (85% compared with 97%) but not as low as the first estimate of 81%. This leads to a combined

figure of 95% which is, we feel, a better estimate of the proportion of people who have been out in the last month.

This estimation procedure has demonstrated that the results based on those people who were interviewed slightly over estimate the proportion of people who go out. However, as we said earlier, we do not know for the 80% or more of non-respondents who did go out how much walking they did compared with those who were interviewed. We cannot tell, therefore, whether the measures that reflect the level of pedestrian activity such as the distance walked, the time spent walking and the number of roads crossed are underestimates or overestimates when based on respondents only. We, therefore, resort to the assumption that the amount of activity among non-respondents who went out is similar to that of respondents who went out. This means that the results will slightly overestimate pedestrian activity due to the disproportionate loss among the non-response of people who did not go out at all.

2 The definition of pedestrian exposure; the interview and observation techniques

2.1 The definition of pedestrian exposure

One of the objects of this survey was to compare distributions of pedestrian exposure with the distribution of the accident statistics, so for our purposes pedestrian exposure was taken to mean 'the exposure to the risk of being involved in a road accident while on foot on the public highway'. This can be equated to the amount people go out and about on foot with some exclusions. Any walking done in places where a pedestrian accident would not be recorded in the accident statistics had to be excluded. Thus walks on private land, in parks, through shopping precincts and so on were omitted from our measure. Also excluded, of course, was any walking done out of Great Britain.

By defining our interest as the amount people go out and about on foot on the public highway, there was then a choice of units in which 'amount' could be measured. The simplest way was to divide the population into those who never went out on foot and those who did. This gives an approximate estimate of the exposure levels of, for example, different age groups. In the description of the sample it was stated that only one day was to be asked about and so we had a further simple measure of whether the informant went out on that day or not. However these measures divide the population into only two groups: the people with zero exposure and those with some exposure, but obviously we need to be able to look in more detail at the positive distribution.

When an assessment of travel of any kind is considered, distance is an obvious unit of measurement. In this inquiry time was also an important factor as, although a person may not walk very far, the amount of risk he was exposed to might vary with the length of time he was on foot.

There was a third measure of exposure which could be used directly or indirectly in comparison with the accident figures. The 1975 accident statistics showed that about 84% of pedestrian accidents happened while the pedestrian was crossing the road, so a relevant measure to use was the number of roads crossed while out walking. This could then be used indirectly as an estimate of total pedestrian exposure or directly to be compared with accidents which happened to pedestrians when crossing the road.

2.2 Method of obtaining exposure measures

We had initially hoped to collect the information for all the measures by an interview in the home. However, preparatory work soon revealed that although people could generally remember the routes they had taken and could give estimates of how far and for how long they had walked, they did not know and could not deduce the total number of roads they had crossed. It was clear that people can walk across a number of side roads and not remember any of them. This indicated that there was a need to use some form of observation. We decided to try the technique of asking for the exact detail of whether the informant had walked and then sending the interviewer to rewalk all the routes observing the roads crossed as she went. This would also allow us to collect much more detail about the roads crossed for comparison with the accident statistics.

A feasibility study was carried out in May 1975 and we found that the idea was a practicable one. Using the interviewers in this way enabled us to introduce two extra measures of pedestrian activitiy as refinements to the number of roads crossed. These were the number of paces taken by the interviewer to cross the road and the number of 'safe points' involved. The 'safe points' concept was initially introduced as a practical aid for producing uniform observation techniques, but we also hoped it would be of some value in the analysis. For our purposes a 'safe point' was defined as a pavement, a central island or a verge. The term 'verge' was used to describe the edge of the road where there was no apparent pavement. Obviously some of the 'safe points' were less safe than others but the concept implied was an area on the public highway where the pedestrian could expect to walk or stand in relative safety.

Thus we were planning to collect information about five different exposure measures: time out walking, distance walked, number of roads crossed, number of safe points involved, and number of paces used by the interviewer to cross the roads. The last three were all to be obtained by observation of the reported routes. The information about the length of time taken to do the walks could only be obtained through the interview but we had a choice for distance. Many people find distance a difficult quantity to estimate, much more so than time. As the interviewers were going to be rewalking all the routes we chose to use them to measure the distance walked. We considered the use of pedometers but felt this would introduce unnecessary complications and imply an accuracy greater than was justified. Instead we decided to calculate the distance using the length of time it took the interviewer to retrace the walk (with an allowance for the time taken to record the observations) and some measure of her walking speed. A detailed description of the calculation used will be found in Appendix C.

This final method meant that we were using a combination of interview data and observation of the reported routes for four of the measures of pedestrian activity and interview data alone for the fifth one.

2.3 The interview

A copy of each of the documents used will be found at the end of this report.

As well as collecting information about pedestrian activity we also used the interview to find out about other aspects of the informant as a pedestrian. General classification information was collected at the beginning of the interview including age, sex, marital status and employment status, whether there was a car in the household and whether the informant held a driving licence. There was also a very general question about the informant's health. We then went on to ask about the informant's behaviour as a pedestrian, his attitudes to other road users and what he thought made roads dangerous. At this point the interview was concluded for people who never went out on foot and for people who had an odd serial number and were aged between fifty and fifty-nine (see Section 1.4).

After the questions about the journeys on the sample day which we will describe later there was a section on road safety which covered zebra and pelican crossings. This was followed by some questions on the informants' involvement in any road accidents or 'near misses', and finally a comparison of crossing the road today with five years ago.

However, the central part of the interview was taken up by collecting the information about the sample day. This gave rise to two main problems; one was the amount of detail that we needed which might have caused the informant to become bored and so withhold information and the other was the fact that the amount of information to be collected would vary a great deal from person to person.

At the feasibility stage we found that the best way to overcome these problems was to 'map out' the day first and then ask about the detail for the parts of each journey on foot. In 'mapping out' the day the interviewer had to work through the sample day in two-hour periods asking if the informant had gone out at all in each time period specified. If he had gone out we asked how many journeys he had made in that time period defining journey as a trip having only one main purpose, and then for each journey we ascertained this purpose, the beginning and end points of the journey, the time it started and finished, and the transport used. The journey was then divided into sections so that each section was either wholly on foot along the public highway or contained no walking along the public highway at all.

The interviewer then continued asking about journeys through the sample day. When the end of the day was reached and a check had been made for any journeys omitted, a section description sheet was completed for each section on foot along the public highway. On this sheet we collected information about the time of start and finish of the walking section and how long the walk took (as a check); whether the informant was walking in a built up area (defined as having a 30 or 40 mph. speed limit) and whether there was always a pavement where the informant was walking. We then asked whether the informant was alone or if he had an adult, child or dog with him and if so whether it was for all or part of the walk. The interviewer then had to obtain the detailed description of the walk with which she would retrace the route. This information was obtained for every section of every journey which had been on foot on the public highway.

When the interview was complete the walking routes described had to be rewalked by the interviewer and observations made for all the roads crossed.

2.4 Interviewer observation of the reported routes

For each section of a journey that was wholly on foot on the public highway an observation sheet was needed. The interviewer observation of the reported routes provided the information needed to calculate the distance walked in addition to information about the number of roads crossed and their associated details. In order to calculate the distance we needed to know how long the walk took so the time the interviewer set off and finished was recorded. If no roads were crossed this was noted together with the time taken for the walk. Interviewers recorded time to the nearest minute and the minimum time for any walk was set at one minute.

Each time a road to be crossed was reached one or more lines on the observation sheet had to be completed. One line had to be filled in every time the interviewer crossed from one 'safe point' to the next 'safe point' (see Section 2.2). The lines were numbered starting at one for each new walking section and the total number of lines was noted.

For each 'safe point' to 'safe point' crossing, various details about the road layout were recorded, referring to junctions, aids to the pedestrian in crossing, traffic direction, class of the road to be crossed together with the junction road (if there was one) and the number of paces it took the interviewer to cross between the two 'safe points'.

All this information, apart from the number of paces, was recorded before the interviewer set off to cross the road. In cases where more than one line was needed for one road all lines were completed apart from the paces column before the road was crossed.

Whether roads were split because there was a central reservation of some sort the information recorded on each line referred only to the part of the road as it was between the two 'safe points', thus information about a two way road with a central island was recorded on two lines each having one way traffic flow, the first from the right and the second from the left. At the computing stage the information was combined to recreate a two way road.

At the completion of the walk the total time taken by the interviewer and the total number of lines were recorded on the relevant section description sheet.

2.5 Aggregation of the data

In order to cope with the large variations in the amount of walking done by people in one day the inquiry was designed in such a way as to produce a variable length of record. Social Survey Division uses a computer program for tabulations which is designed to work on fixed length records. We therefore had to amalgamate the data in some way to produce the same length of record for all informants. This involved summing the information on the section description and observation sheets to produce the same number of totals for each informant. Items of information were summed separately or in combination to produce totals ranging from the very simple, for example the total number of roads crossed on the sample day, to the fairly complex, such as the total time spent walking alone in travelling to or from work on the sample day.

This requirement of having to amalgamate the data before any analysis could be done meant that a very clear idea of the intended analysis was needed, so that all the relevant combinations of the data were created. In fact, about eight hundred new items of information were created for each person, thus rendering the data in a form suitable for the production of tabulations.

2.6 This study and comparisons with other sources of data

In the next chapters we shall look at the average measures of pedestrian exposure for the overall sample and make comparisons for different groups of people. This is followed by a section on road safety and pedestrians' attitudes, and finally a comparison of our data with accident statistics produced for the same period of time.

Clearly, our primary concern in this study was the comparison between the data collected within the inquiry and the accident figures. Throughout the design of the inquiry we have tried to maximise the amount of data collected based on the same definitions as other transport and travel surveys thus making external comparisons viable. In some places, however, the requirements for this survey and general comparability conflicted. For example the technical difficulties associated with trying to record accurately the walking parts of journeys resulted in journeys being split into smaller trips than would normally be the case. Journeys, and trips as such, were not of great relevance to this inquiry as we were planning to analyse the data by the amount of walking per day rather than the number of journeys made. We have thereby sacrificed some areas of comparability with other studies in particular the National Travel Survey in order to make the pedestrian exposure measures as accurate as possible (see Appendix D).

With any survey where the data is collected retrospectively there is always some concern about how accurately people can remember the events they are being asked about. This is particularly the case when the subject matter of the survey is a fairly incidental part of life such as those parts of a person's journeys that have been carried out on foot on the public highway.

It is very difficult, expensive and time consuming to set up a test to measure the extent that such data is affected by the memory factor, but the interviewers were instructed to check carefully whether all journeys had been accounted for and the design purposely established the overall pattern of the day's journeys before asking for the very detailed information. Nevertheless it is likely that some were omitted either because they were forgotten or because the person became tired of the level of detail that we were asking.

The survey is therefore likely to underestimate pedestrian activity to some extent but with the methods and checks used this loss will have been minimised.

PART I

Pedestrian activity

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3 The measurement of pedestrian activity

3.1 Introduction

In this study we were concerned with the exposure of pedestrians to the risk of being involved in a road accident. All people on foot on the public highway can be said to be at risk so to ascertain the amount of exposure pedestrians experience one needs to measure how much people go out and about on foot on the public highway.

Through drawing a sample of adults from the whole population of Great Britain the informants' levels of pedestrian activity covered the whole spectrum of pedestrian experience, ranging from those who never left their homes to those who spent most of the day walking. Thus the simplest measure of pedestrian activity was whether people could go out or not, but this did not quite satisfy our definition as we needed to know whether people did any walking along the public highway or not. This meant that people who could go out were divisible into those who went out but never did any walking and those who did some walking. Obviously people who go out but never walk along the public highway have a zero risk of being involved as a pedestrian in a road accident just as those people who never leave their homes do, so these two groups can be amalgamated. As we have previously explained we asked each informant about one particular day and so it was possible for a person not to have gone out on that day or to have gone out but done no walking while, if the information collected had covered a longer period of time, they would have done both. Thus the original simple variable has four different categories: those who cannot go out on foot, those who happened not to have gone out on their sample day, those who went out but happened not to do any walking on their sample day and those who did some walking.

3.2 The activity measures used

Estimates produced using these simple exposure statistics give no measure of the variation in pedestrian activity experienced by the largest group, that is those people who did some walking. Thus we needed some measure of the amount of walking done. In fact we used three different measures: distance, time and the number of roads crossed. Associated with the number of roads crossed were the number of 'safe points' used (see Section 2.2) and the number of paces taken by the interviewer to cross the road.

The measures were defined as follows:

Distance — the total distance covered on foot on the public highway. This was estimated for each walk using the product of the time taken by the interviewer to rewalk the route, with an allowance for the time taken to complete the observation sheets, and an average measure of the interviewers' walking speeds. A detailed description of this will be found in Appendix C.

Time — the total time spent on foot on the public highway. An estimate of this was obtained during the interview by asking the informants. They were asked to estimate the time they started the walking section, the time they finished it and as a check, the total time it had taken. All times were recorded to the nearest minute.

Any time not spent on foot on the public highway was meant to be excluded but it is very difficult for informants to do this especially for journeys where the travelling time could well have been interrupted such as in journeys connected with shopping.

Roads crossed — the total number of roads crossed excluding private roads, and exits and entrances to car parks, forecourts etc. Service roads were included. This followed the definition of the public highway used in the police accident reports. The number of roads crossed was obtained by interviewer observation when retracing the routes. Details about each road were completed on the observation sheet.

Safe points — the number of times the informant stepped from a place of relative safety (the pavement, the edge of the road or a centre island of some kind) into the road. (See Section 2.2).

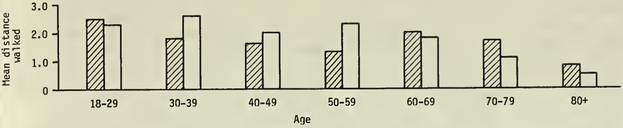
Paces — the total number of paces taken by the *interviewer* to cross all the roads crossed. The variation in interviewer pace length was estimated when their walking speeds were measured; the results will be found in Appendix C. The 'paces' measurement was collected in order to provide us with an estimate of road width.

Obviously any analysis would become very cumbersome if these five measures were used together at every stage. However an examination of the distribution of the mean values of these exposure measures for age and sex (Figure 3.1) shows that the number of roads crossed, the number of safe points and the number of road crossing paces all have very similar distributions while distance and time differ slightly. As safe points and paces were defined as refinements of the road measurement we have used the number of roads crossed, the time spent walking and the distance walked for the main analysis or just one of these three for some particular sections.

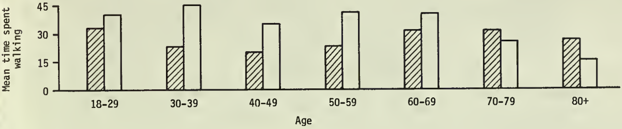
The similarity of the roads crossed, safe points and paces distributions is interesting in its own right for it indicates that there is little tendency for older people to cross narrower roads or to make more frequent use of central refuges than younger adults do, the same being true for

Figure 3.1 Mean pedestrian activity measures

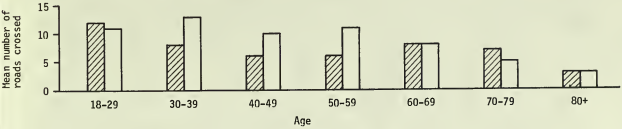
a) Mean distance walked per day (kilometres)



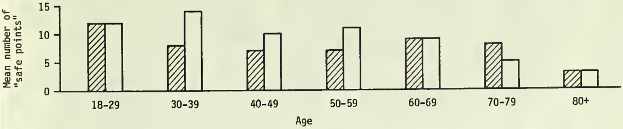
b) Mean time spent walking per day (minutes)



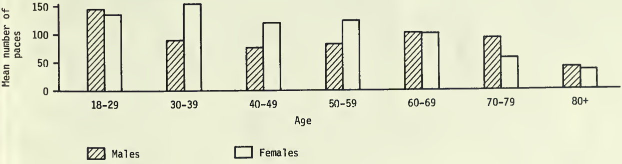
c) Mean number of roads crossed per day



d) Mean number of road sections crossed per day ("safe points")



e) Mean number of interviewer road crossing paces per day



the differences between the road crossings of men and women.

The amount of walking done by different people is mainly determined by their lifestyles. It is likely therefore that simple personal characteristics as indicators of lifestyle will be related to pedestrian activity. Another major contribution to variation in exposure will be from those variables actually related to the walking done rather than to the person who did the walking, such as the reason for the journey in which the walking took place and the day of the week on which it was done.

In the next three chapters we will look at the variation in pedestrian activity with respect to these different types of variables.

4 Personal characteristics and pedestrian activity

4.1 Introduction

The personal characteristics we will use in looking at the variation in pedestrian activity are age, sex, marital status, employment status, whether the household has a car and whether the informant holds a driving licence. The first two in this list are particularly important as these details are known for the accident statistics. Marital status and employment status were felt to be important because of the different lifestyles that might be associated with the different statuses and we considered it likely that car availability and licence holding would be directly related to the amount of walking done.

4.2 Average pedestrian activity in relation to personal characteristics

In Table 4.1 we look at the mean values of the three exposure measures for all people and by age and sex. Throughout this report two age groups are used: one combining people aged eighteen to fifty-nine and one combining people aged sixty and over.

All mean values, unless otherwise indicated, will be based on totals for the whole sample including the people who did not go out at all on their sample day and who therefore made a zero contribution to the mean value.

Table 4.1 Mean pedestrian activity by age and sex

	Mean no of roads crossed per day	Mean time spent walking per day (mins)	Mean distance walked per day (kms)
All people	8.9	32.6	1.94
Age			
18-59	9.7	33.2	2.08
60 and over	6.7	31.0	1.55
Sex			
Male	8.1	26.9	1.82
Female	9.6	37.6	2.04

For bases see tables in Table Section.

On the basis of the method used, this survey provides us with an estimate of the average amount of walking done. On a single day in September or October 1975 people crossed on average nearly 9 roads, spent over half an hour walking and walked a distance of nearly 2 kilometres. Adults aged less than sixty crossed more roads and covered a greater distance on foot than those aged sixty and over but there was no difference in the time these two groups spent walking. Women experienced a greater amount of pedestrian exposure than men. The differences for men and women were consistent for all three measures but were not as large as those seen between the two age groups. Thus while the younger adults crossed 9.7 roads on average compared to the 6.7 roads crossed by the elderly, women crossed 9.6 roads on average compared to 8.1 roads crossed by men.

We now go on to look at how the combination of age and sex affects the variation in pedestrian activity (Table 4.2).

As might be expected from combining the two overall results of women being more active than men as pedestrians and younger adults doing more walking than older adults, it is women aged less than sixty who experienced the most pedestrian exposure whatever measure was used. Younger women crossed on average 11.1 roads, spent 40.3 minutes walking and walked for 2.33 kilometres. However the group of people with the lowest exposure was not elderly men as might be expected from the overall results but elderly women. Women aged sixty or more crossed fewer roads and covered less distance on foot than the people in the other groups.

The variation in pedestrian activity which occurred with age was much greater among women than among men. It is clear from the more detailed results that the overall difference of women doing more walking than men is, in fact, the result of a much greater pedestrian activity among women aged less than sixty than among men of the same age group while for the older adults women actually had a lower pedestrian activity level than men.

Of the three measures shown the time measure was the only one where for the elderly there was no difference in the amount of pedestrian activity between the two sexes and where in fact it was men aged less than sixty who experienced the least pedestrian exposure.

Table 4.2 Mean pedestrian activity by age together with sex

Sex	Age 18-59	Age 60 or more
	Mean number of roads crossed per day	
Male	8.3	7.6
Female	11.1	6.0
	Mean time spent walking per day (mins)	
Male	25.6	30.9
Female	40.3	31.1
	Mean distance walked per day (kms)	
Male	1.82	1.81
Female	2.33	1.35

For bases see tables in Table Section

Table 4.3 Mean pedestrian activity by various personal characteristics

Personal characteristics	Mean no of roads crossed per day	Mean time spent walking per day (mins)	Mean distance walked per day (kms)
Marital status			
Married	8.3	31.8	1.82
Single	13.3	38.8	2.66
Other	7.0	29.5	1.48
Employment status			
Full time	8.7	27.8	1.91
Part time	11.3	40.3	2.28
Not employed	8.4	36.0	1.86
Car availability			
Car in household	7.5	28.6	1.64
No car in household	11.1	38.6	2.40
Driving licence			
Holds current licence	6.9	24.5	1.54
Used to hold licence	7.7	33.9	1.84
Never held licence	10.9	40.0	2.31
All persons	8.9	32.6	1.94

For bases see tables in Table Section

Considering other personal characteristics and their relationship to pedestrian exposure (Table 4.3) we found that single people did more walking than married people; part time workers walked more than either those in full time employment or than people not in employment; and, not surprisingly, people with cars or driving licences walked far less than those without.

The variation in pedestrian activity with respect to marital status is likely to be due to an unequal age and sex distribution within the two groups. We have already seen that pedestrian exposure varied more with age among women than among men and, taking the mean number of roads crossed as a single indicator of pedestrian activity, Table 4.4 shows that among women age seemed to bear more relationship to the amount of walking done than did marital status.

Table 4.4 Mean number of roads crossed per day by marital status age and sex

Marital status	Age 18-59		Age 60 and over	
	Male	Female	Male	Female
Married	6.6	10.7	7.2	6.4
Single	14.8	13.5	13.2	6.6
Other	10.7	11.2	7.6	5.6

For bases see tables in Table Section

However among men the opposite was true with single men crossing about twice as many roads as married men in both age groups.

Table 4.5 shows how the number of roads crossed varied with employment status, age and sex.

Table 4.5 Mean number of roads crossed per day by employment status age and sex

	Employment status		
	Full time	Part time	Not employed
Age			
18-59	8.7	12.1	11.0
60 and over	8.5	8.0	6.2
Sex			
Male	7.8	7.2	9.3
Female	11.1	11.7	8.2

For bases see tables in Table Section

Separating employment status for men and women removed the overall difference of part time workers having the greatest pedestrian activity, and for the two sexes and the two age groups a difference in pedestrian exposure is seen between the full time workers and those who were not in employment. It is interesting to note that whereas men who were not employed crossed on average slightly more roads than employed men, women who were not employed crossed far fewer roads than employed women. A similar reversal occurred between the two age groups with full time workers in the younger age group crossing fewer roads than those not employed in that age group while among the people aged sixty and over the full time workers crossed more roads on average than those who were not employed. This latter result occurred presumably because people aged sixty or more who were still in full time employment were probably in their early sixties or still very active.

Table 4.6 Mean number of roads crossed per day by car availability licence holding and sex

	Mean number of roads crossed per day	
	Male	Female
Car availability		
Car in household	6.2	8.8
No car in household	11.7	10.6
Driving licence		
Holds current licence	6.3	8.1
Used to hold licence	8.8	4.8
Never held licence	12.2	10.4

For bases see tables in Table Section

Table 4.6 shows the variation in the numbers of roads crossed by car usage and sex. There was more variation in the pedestrian activity of men with respect to whether there was a car available or the person held a driving licence, than was the case among women. In fact men who did not have a car or hold a driving licence crossed more roads than women did (11.7 and 12.2 for men compared with 10.6 and 10.4 for women) whereas the overall pedestrian activity level was 8.1 roads crossed by men compared to 9.6 by women.

The other sub groups in which the pedestrian activity level, as measured by the number of roads crossed, was higher for men than for women, were the elderly and the single. Of these three attributes: being single, being elderly and having a car available, the third seems the most likely to have a direct bearing on the amount of walking done. It is also likely that single people and the over sixties were groups among whom car ownership was lower. So in Tables 4.7 and 4.8 we look at these three variables to see if car availability explains the reversal of the overall difference in pedestrian activity between men and women.

Table 4.7 Mean number of roads crossed per day among people aged sixty or more by car availability and sex

Sex	People aged sixty and over		
	All	Car in household	No car in household
Male	7.6	5.1	9.7
Female	6.0	5.4	6.2

For bases see tables in Table Section

Men aged sixty and over crossed more roads than women in the same age group but separating the figures according to car availability shows that this difference is only found among the group who did not have a car in the household while no difference exists at all among those who did have a car.

A similar variation occurred among people who were single (Table 4.8). Overall, single men crossed more roads than single women but there was no difference in the exposure of men and women who were single and whose household had a car, while among those who did not have a car the overall difference is exaggerated with single men crossing as many as 20.2 roads on an average day.

Table 4.8 Mean number of roads crossed per day among single persons by car availability and sex

Sex	People who are single		
	All	Car in household	No car in household
Male	14.6	10.9	20.2
Female	11.9	10.0	13.2

For bases see tables in Table Section

Thus, overall, women showed a greater pedestrian activity level than men and the one factor that reversed this relationship was the non-availability of a car. Thus, men would probably have a greater overall pedestrian activity rate than women if there were no cars, or if car availability and usage was as high among females as it is among males.

In terms of the other personal characteristics we found that men in full time employment experienced slightly less pedestrian exposure than men not in employment while the reverse was true for women, with the difference being much greater. Women aged sixty and over apart, we found that all single people had a higher pedestrian exposure than married people. In fact single people had the highest average pedestrian exposure. It would thus appear that while employment status showed a greater association with the pedestrian activity of women than with that of men it was marital status that had the greater effect on the pedestrian activity of men. This is made clear by the last table in this section, Table 4.9.

Table 4.9 Mean number of roads crossed per day by sex, marital and employment status

Sex	In employment		Not in employment	
	Married	Not married	Married	Not married
Male	6.6	13.6	7.4	13.9
Female	11.2	12.0	8.7	7.3

For bases see tables in Table Section

4.3 The variation in overall pedestrian activity in relation to personal characteristics

In this chapter so far we have been looking at the mean values of the exposure measures which, as we said previously, are averages taken over the whole population including people who did not go out on their sample day. This means that the variation in the averages which we have seen can be attributed to two different factors, one being the different proportion of people in each group who did no walking at all on their sample day and the other being the variation in the amount of walking done by those people who did some. The definition of walking used in this study means that only those people who walked along the public highway contributed to this latter group. We shall look at the variations in the former group first.

The people who do no walking, as defined in our terms, can be divided into three different groups: those who cannot go out on foot, those who happened not to go out on their sample day and those who went out but did no walking along the public highway. Although for the purposes of measuring pedestrian exposure these three groups all make a zero contribution it is of interest to see how the size of the groups vary according to different personal characteristics. Table 4.10 shows the distribution of people among these groups.

Table 4.10 Distribution of overall pedestrian activity

Overall pedestrian activity	All persons
	%
Cannot go out on foot	2
Did not go out on sample day	12
Went out but did no walking	16
Walked on sample day	70
	100
Base[1]	*7120*

[1] *All bases given in the text tables are weighted (see Section 1.7) Actual sample sizes for various sub groups are given in the Table Section.*

Among the adult population 2% could not go out on foot thus 98% were able to do some walking. However on an average day only 70% of adults did any walking whereas 16% went out but did no walking and a further 12% did not go out. (At this point it must be remembered that the information was collected in September and October so that the figures only strictly hold for these two months). Having seen how the figures vary for all adults we now look at the distributions for the two age groups and men and women. (Table 4.11).

The distribution of the overall pedestrian exposure for the younger adults was significantly different from that of the elderly, and the same was true for the two distributions for men and women. However, there was more difference between the young and the old in the proportion

Table 4.11 Distribution of overall pedestrian activity by age and sex

Overall pedestrian activity	Age		Sex	
	18-59	60 and over	Male	Female
	%	%	%	%
Cannot go out on foot	1	7	2	3
Did not go out on sample day	8	22	9	14
Went out but did no walking	18	10	22	10
Walked on sample day	73	61	67	73
	100	100	100	100
Base	*5188*	*1932*	*3339*	*3781*

For unweighted bases see tables in Table Section

of people who did some walking on an average day than there was between men and women.

Only 1% of adults aged less than sixty never go out on foot compared with 7% of adults aged sixty and over. As many as 22% of the elderly did not go out on their sample day which means that just under a third of adults aged sixty and over do not leave their homes on an average day. More young adults went out but did no walking (18% compared to 10% of the elderly). These variations result in 73% of adults aged less than sixty doing some walking on an average day compared to only 61% of adults aged sixty and over who do some walking on an average day.

Looking at the differences between the sexes we see that while more women than men did not go out on their sample day the outstanding difference was between the proportions of men and women who went out but did no walking. There were 22% of men who went out on their sample day but did no walking, compared with only 10% of women. Since it is probable that this group comprised mainly people travelling in private cars driving from 'door to door' then from the analysis of the relationship of car availability and the pedestrian exposure of men this large difference might be expected. Thus although more men than women went out on their sample day fewer of them did any walking on the public highway.

We now go on to look briefly at how these proportions vary according to the other personal characteristics.

A greater proportion of single people walked on an average day than married people did although there was no difference in the proportions of people who actually went out. The figures for the widowed, separated and divorced group ('other') are obviously influenced by the fact that many of this group were elderly. Looking at employment status we found that more part time workers than full time workers did some walking on an average day (80% compared to 71%) while only 66% of those who were not in employment did some walking on an average day. As in the case of the mean values the high proportion of part time workers who did some walking is explained by the age and sex composition of this group.

As one might expect a greater proportion of people who live in households without a car did some walking on an average day than did those in households with a car. The difference, 74% compared to 67%, was not quite as large as it might be when we consider that 23% of those people with an available car went out but did no walking compared to only 5% of people who live in households without cars. This is due to the fact that many more people without cars did not go out at all which reflects the age distributions within the two groups. Very similar variations can be seen for whether people held driving licences or not.

Thus all these variations in the proportions of people who have zero pedestrian exposure on an average day and conversely of those who do go out on foot are in general similar to the differences seen between the overall mean values. We now go on in Section 4.4 to look at the variations which occur in the mean exposure measures when they are based on only those people who did some walking.

Table 4.12 Distribution of overall pedestrian activity by various personal characteristics

Personal characteristics		Can not go out on foot	Not out on sample day	Out but no walking	Walked	Total	*Base*
Marital status							
Married	%	1	11	18	70	100	*5244*
Single	%	2	7	11	80	100	*1092*
Other	%	11	21	5	63	100	*775*
Employment status							
Full time	%	—	7	22	71	100	*3459*
Part time	%	—	9	11	80	100	*876*
Not employed	%	6	19	9	66	100	*2769*
Car availability							
Car in household	%	1	9	23	67	100	*4303*
No car in household	%	5	16	5	74	100	*2817*
Driving licence							
Holds current licence	%	1	8	26	65	100	*3285*
Used to hold licence	%	7	18	12	63	100	*264*
Never held licence	%	4	14	6	76	100	*3535*
All persons	%	2	12	16	70	100	*7120*

4.4 Average pedestrian activity in relation to personal characteristics among people who did some walking

Having seen how the proportions of people who did no walking varied, this section looks at the second factor which affects the overall mean: the amount of walking done by those people who did some. All the mean values used in this section are based on the people who did some walking along the public highway on their sample day (70% of the total sample).

People who did some walking crossed on average 12.7 roads, spent 46.3 minutes walking and walked for an average distance of 2.76 kilometres per day (Table 4.13). Adults aged less than sixty crossed more roads and walked further than the elderly while the latter group spent more time walking. There was very little difference in the numbers of roads crossed by men and women who did some walking or in the distance they walked. However, women spent longer on foot than men.

The variation in the mean exposure measures of people who did some walking was very similar to the variation seen in the means taken over all people (Table 4.14). Among people who did some walking single people crossed more roads and walked further than people who were married, widowed, separated or divorced, but there was no difference in the time spent walking. We investigated these values separated for the two age groups and the two sexes, as we did for the overall mean values, and we found that there was no difference in the exposure of married and single women nor of married and single old people, while single men and single people aged less than sixty who did some walking had a greater pedestrian activity than married people in either of these groups.

Among people who did some walking the average level of pedestrian activity did not show as much variation with employment status as we saw for the means taken over all people. However, both car availability and the holding of a driving licence were related to the pedestrian exposure of people who did some walking. Among these people the group whose household did not have a car and the group who did not hold a driving licence experienced more pedestrian exposure than the people in the other groups.

We said previously that the overall mean exposure values could be affected both by the proportion of people in each group who do no walking and by the amount of walking done by those who do some. Having looked at all three statistics separately we can now compare them and see if this is in fact the case.

The previous results have shown that the overall variation in pedestrian activity with respect to age arose both from the large differences in the proportions of people who did any walking at all on their sample day and the different levels of pedestrian activity among those who did some walking. The overall differences in exposure seen between the two sexes, however, show a slightly different picture. Although women had a higher pedestrian activi-

Table 4.13 Mean pedestrian activity of people who did some walking by age and sex

	Among people who do some walking		
	Mean no of roads crossed per day	Mean time spent walking per day (mins)	Mean distance walked per day (kms)
All persons	12.7	46.3	2.76
Age			
18-59	13.2	45.0	2.83
60 and over	11.0	50.7	2.53
Sex			
Male	12.1	40.2	2.71
Female	13.1	51.3	2.79

For bases see tables in Table Section

Table 4.14 Mean pedestrian activity of people who did some walking by various personal characteristics

Personal characteristics	Among people who did some walking		
	Mean no of roads crossed per day	Mean time spent walking per day (mins)	Mean distance walked per day (kms)
Marital status			
Married	12.0	45.8	2.68
Single	16.5	48.3	3.31
Other	11.2	47.2	2.37
Employment status			
Full time	12.2	39.1	2.69
Part time	14.2	50.6	2.86
Not employed	12.8	54.6	2.82
Car availability			
Car in household	11.1	42.4	2.42
No car in household	14.8	51.8	3.22
Driving licence			
Holds current licence	10.6	37.6	2.37
Used to hold licence	12.2	54.0	2.92
Never held licence	14.4	52.8	3.05
All persons	12.7	46.3	2.76

For bases see tables in Table Section

ty level than men whatever measure was used for the overall means, among men and women who did some walking the only outstanding difference was seen for the time measurement where women spent over 10 minutes more walking than men did on an average day. Thus the overall variation in the mean exposure levels between the two sexes appears th be due mainly to the greater proportion of women who did any walking at all on an average day, a difference which we have seen arises from what we have taken to be the greater car usage by men (ie more men going out but not doing any walking). This adds support to the hypothesis that the differences in the overall mean pedestrian exposure seen between men and women were due to the availability and usage of cars.

Turning now to the composition of the mean exposure values for the different personal characteristics we see that for marital status not only did a greater proportion of single people than of married people go out on foot on an average day but they also did more walking when they were out in terms of roads crossed and distance walked which led to a very much higher overall mean exposure. The higher level of pedestrian activity among people who worked part time stems mainly from the fact that on an average day far more of them went out on foot whereas among those who did some walking there were very few differences in the amount of pedestrian activity experienced. Since we have seen that the overall variation was associated with the differing sex distributions within the different employment groups then the relationship we have found between these three statistics is to be expected as it is comparable to that seen for the two sexes.

The large differences seen in the overall mean exposure values for the car usage variables were attibutable to both the fact that a greater proportion of people without a car in the household or without a driving licence did some walking on an average day and that among those who did some walking the same two groups experienced more pedestrian exposure whatever measure was used.

4.5 Summary

On an average day people crossed 8.9 roads, spent 32.6 minutes walking and walked for 1.94 kilometres. These figures are the result of a combination of two different variables: the proportion of people who did any walking at all and the amount of walking done by those who did some. Of the adult population 70% did some walking along the public highway on an average day. These people crossed, on average, 12.7 roads, spent 46.3 minutes walking and walked for 2.76 kilometers.

Overall, people aged less than sixty did more walking than those aged sixty and over and women walked more than men. The age difference was only apparent for women while there was no difference in the amount of walking done by older and young men. The difference in pedestrian activity between the two sexes appears to be influenced by the greater car usage among men.

Single people had a higher level of pedestrian activity than married people, this being especially so for men. The difference in pedestrian exposure between people who were in full time employment and those who were not varied with age and sex. Among both the younger adults and the men, full time workers crossed fewer roads than those who were not employed while among the older adults and the women, full time workers crossed more roads than those who were not employed.

5 Day of the week and pedestrian activity

5.1 Introduction

The sample for the survey was designed to give not only a representative sample of individuals but also a representative sample of days of the week. Thus each person was asked about one preselected day (the sample day). As we have said previously (Section 1.6), the number and distribution of pedestrian accidents throughout the day are very similar for Monday to Thursday but vary for Friday, Saturday and Sunday, so, for the purposes of accident studies, it is possible to group together data for Monday to Thursday whereas data for Friday, Saturday and Sunday needs to be presented separately. The sample of days about which we collected pedestrian exposure information was designed accordingly and we shall compare the average exposure measures for the first four days of the week with those for Friday, Saturday and Sunday separately.

5.2 Average pedestrian activity in relation to day of the week

When we were examining the relationships between pedestrian activity and personal characteristics the days were added together correctly weighted to give results for an average day of the week, but the data will now be separated to show how pedestrian exposure varies by day of the week. (Table 5.1)

Table 5.1 Mean pedestrian activity by day of the week

Day of the week	Mean no. of roads crossed per day	Mean time spent walking per day (mins)	Mean distance walked per day (kms)
Mon-Thurs	9.1	30.7	1.93
Friday	10.6	40.2	2.29
Saturday	10.5	47.8	2.32
Sunday	4.8	17.1	1.22

For bases see tables in Table Section

The outstanding feature of Table 5.1 is how little pedestrian activity took place on Sundays. On Sundays people crossed an average of 4.8 roads compared to 10.5 on Saturdays, they spent 17.1 minutes walking compared to 47.8 minutes on Saturdays and they walked for an average of 1.22 kilometres compared to 2.32 kilometres covered on foot on Saturdays. Average pedestrian exposure, whichever measure was used, was at its highest on Fridays and Saturdays.

The variation in pedestrian activity with respect to day of the week for people aged less than sixty reflected the overall variation. For the elderly, however, the difference between Sunday and the rest of the week in terms of pedestrian activity was not so marked. Sunday was still the day when the least walking was done but for all three exposure measures there was very little difference between the averages for Sunday and Monday to Thursday. Among the elderly the day which did stand out was Friday when they crossed an average of 9.0 roads compared to 6.6 on a Saturday and the mean distance covered on foot was 1.98 kilometres compared with 1.61 kilometres on Saturday. Looking at the difference between the young and the old it is interesting to note that, while the overall difference of the younger adults crossing more roads and walking further than the elderly holds for Monday to Thursday and Friday and Saturday, on Sundays there was no difference between the young and the old in the average number of roads crossed or in the distance walked.

Table 5.2 Mean pedestrian activity by day of the week, age and sex

Day of the week	Mean no. of roads crossed per day	Mean time spent walking per day (mins)	Mean distance walked per day (kms)
	Age 18-59		
Mon-Thur	10.1	31.1	2.11
Friday	11.2	40.0	2.41
Saturday	12.0	52.4	2.60
Sunday	4.9	15.7	1.18
	Age 60 and over		
Mon-Thur	6.6	29.7	1.47
Friday	9.0	40.5	1.98
Saturday	6.6	35.8	1.61
Sunday	4.8	21.0	1.34
	Male		
Mon-Thur	7.9	23.3	1.69
Friday	9.3	32.2	2.14
Saturday	10.1	41.1	2.20
Sunday	5.8	22.0	1.60
	Female		
Mon-Thur	10.2	37.3	2.14
Friday	11.9	47.2	2.41
Saturday	10.8	53.2	2.43
Sunday	4.0	12.6	0.87

For bases see tables in Table Section

As was the case for the elderly the differences between the days were not so marked for the men. The only exposure measure which resulted in a significantly lower value for Sundays was the average number of roads crossed (5.8 as compared with 7.9 on Mondays to Thursdays). Friday and Saturday were the days when men experienced most pedestrian exposure and this was also true for women in terms of time spent walking and distance walked but there was no difference among women between the average number of roads crossed on a Saturday and the number crossed on a Monday to Thursday. Among women, Sunday was a day of very low pedestrian activity compared to the rest of the week with, for example, only 4.0 roads crossed compared to 10.2 on Monday to Thursday. The differences seen in pedestrian activity between the two sexes for an average day were repeated for Mondays to Thursdays and Fridays. However, on Saturdays there was no difference between the average number of roads crossed by men and women nor in the average distance walked. On Sundays the roles were totally reversed with men having a higher pedestrian exposure whatever measure was used.

5.3 The variation in pedestrian activity in relation to day of the week among people who did some walking

As in the case of the personal characteristics the mean values we have presented here are influenced by two different factors, one being the proportion of the total sample who did any walking at all on each day, and the other being the amount of walking done by these people. We now go on to see how this former proportion varied according to day of the week.

Table 5.3 Proportion of people who did some walking by day of the week, age and sex

Day of the week	Proportion of people who did some walking				
	All persons	Age		Sex	
		18-59	60 & over	Male	Female
Mon-Thur	74%	78%	63%	67%	80%
Friday	74%	77%	66%	73%	75%
Saturday	75%	79%	64%	74%	75%
Sunday	48%	48%	46%	53%	43%

For bases see tables in Table Section

It is immediately obvious from Table 5.3 that the low mean exposure levels found for Sunday were heavily influenced by the low proportion of people who did any walking at all on that day. On an average Monday to Thursday, Friday and Saturday three quarters of the population did some walking, whereas on a Sunday this proportion dropped to less than a half.

The proportion of people who did some walking on a Sunday showed no variation with respect to age whereas on the other days of the week more than three quarters of the under sixties did some walking compared to only two thirds of the elderly. This variation explains to some extent the smaller differences seen among the elderly in the mean exposure values for Sundays as compared to other days of the week. The proportions of men and women who did some walking on different days of the week showed similar variations to the mean values. More men than women did some walking on a Sunday (53% compared to 43%) while a greater proportion of women than men did some walking on Monday to Thursday, (80% compared to 67%). Looking at the within sex variations we can see that whereas women maintain a high level of pedestrian activity throughout the week which only changes on Sundays the men show a more varied pattern of activity by day of the week. Only 67% of men did any walking on Mondays to Thursdays while on Fridays and Saturdays the figures were higher at 73% and 74% respectively. The figure of 53% for Sundays meant that Sunday was not as different from the rest of the week for men as it was for women.

Thus the low mean exposure values for Sundays for all age and sex groups were to some extent explained by the fact that many fewer people did any walking at all on that day and the high pedestrian exposure found among men on Friday and Saturday was also partly explained by the variation in the proportion who do some walking on those days. There were other differences between the overall means, however, such as older people having a noticeably higher average exposure on Fridays than on other days of the week, that do not seem to stem from any variations in the proportions of people who did any walking. So we now go on to investigate the second factor which causes variation in the overall means: the differing amounts of walking done by people who did some walking.

Table 5.4 Mean pedestrian activity among people who did some walking by day of the week

Day of the week	Among people who did some walking		
	Mean no. of roads crossed per day	Mean time spent walking per day (mins)	Mean distance walked per day (kms)
Mon-Thur	12.3	41.5	2.61
Friday	14.4	54.3	3.09
Saturday	14.0	63.9	3.11
Sunday	10.1	35.8	2.55

For bases see tables in Table Section

People who did some walking on a Sunday crossed fewer roads, walked for less time and covered less distance on foot on average than people who did some walking on any other day of the week although the difference between Sunday and the rest of the week was not as large as it was between the overall mean values. Thus the overall variation was mainly due to a smaller proportion of people doing any walking at all on Sunday rather than to a difference in the amount of walking done by those who did some. However, the greater overall exposure experienced by people on Fridays and Saturdays was due to the fact that people who did some walking on those days did more than those who did some walking on other days.

Table 5.5 shows how these results varied with respect to age and sex. Among the younger adults who did some walking Sunday was the day of least pedestrian activity in terms of the number of roads crossed and the time spent walking but there was no difference between the average distance walked on Sundays and that walked on Mondays

Table 5.5 Mean pedestrian activity among people who did some walking by day of week, age and sex

Day of the week	Among people who did some walking		
	Mean no. of roads crossed per day	Mean time spent walking per day (mins)	Mean distance walked per day (kms)
	Age 18-59		
Mon-Thur	12.9	39.8	2.70
Friday	14.6	51.9	3.12
Saturday	15.1	66.3	3.29
Sunday	10.0	32.5	2.44
	Age 60 and over		
Mon-Thur	10.5	47.2	2.33
Friday	13.7	61.6	3.01
Saturday	10.3	56.1	2.52
Sunday	10.4	45.3	2.88
	Male		
Mon-Thur	11.8	34.7	2.52
Friday	12.7	44.2	2.94
Saturday	13.5	55.2	2.95
Sunday	11.0	41.5	3.02
	Female		
Mon-Thur	12.7	46.6	2.68
Friday	15.8	63.3	3.22
Saturday	14.4	70.9	3.24
Sunday	9.2	29.2	2.02

For bases see tables in Table Section

to Thursdays. However the more noticeable difference was that of the high pedestrian exposure experienced on Fridays and Saturdays by the younger adults who do some walking. Among the elderly who did some walking, Friday was a day of high exposure when they crossed on average 13.7 roads compared to 10.3 on a Saturday. Thus the high overall mean exposure measures for Fridays which we saw in Table 5.3 were due to the amount of walking done by those who did some, rather than to the proportion who did no walking at all.

Among the men who did some walking there were relatively small differences between the days in terms of the average number of roads crossed and the average distance walked, but they spent more time on foot on average on Saturdays than on any other day of the week. Saturday together with Friday were also days of a high level of pedestrian activity among women who did some walking. On average these women walked less on Sundays than on any other day of the week and this fact combined with the low proportion of women who did any walking at all on Sundays results in the very low overall mean exposure measures we saw in Table 5.3.

We have seen that pedestrian activity varies a great deal according to the day of the week on which it takes place. Clearly it is not the day of the week in itself which causes the variation but rather other factors which vary with day of the week. One of the more obvious of these is the variation in purpose of journey according to the day of the week. Thus it could be said that people go to work on Mondays to Fridays, go shopping on Saturdays and do neither on Sundays. Even this highly simplified generalisation could explain a great deal of the variation we have seen. We go on to look at how exposure varies with journey purpose in the next chapter but before we do there is one other aspect of pedestrian activity with respect to day of the week which is of interest.

We chose to look in detail at the variation in the proportion of people who did some walking on each day of the week but there are, of course, other statistics which we could have chosen, one of these being the proportion of people who went out but did no walking on their sample day. It is possible to consider this as representative of the proportion of people who went out in some form of private transport, most probably the family car (although it will also include a small number of people who were able to walk from their accommodation to a park or common land without walking on the public highway). Table 5.6 shows how this figure varies for all people, and men and women separately and it provides an interesting sidelight on the differences in the lifestyles (and therefore pedestrian activity) of men and women.

Table 5.6 Proportion of people who went out on their sample day but did no walking by day of the week

Day of the week	Proportion who went out but did no walking					
	All persons		Male		Female	
Mon-Thur	15%	*4000*	23%	*1884*	8%	*2116*
Friday	14%	*1033*	20%	*486*	8%	*547*
Saturday	12%	*1037*	15%	*464*	9%	*573*
Sunday	24%	*1050*	28%	*505*	20%	*545*

For unweighted bases see tables in Table Section

The first column of this table shows that the low pedestrian activity found on Sundays was due not only to the fact that fewer people went out but also that more people did not not walk along the public highway when they did go out. This in general means getting into a car outside the house (or in the driveway) and alighting from it immediately outside the destination. The figures for men and women show another reason for the difference in exposure between Sunday and the rest of the week being smaller for men than for women. For while twice as many women went out on Sunday but did no walking as on any other day of the week the differences were much less apparent among the men. In fact, apart from Saturday, more than one in five men went out but did no walking on every day of the week.

These figures once again lead to the question of what people did on these days and how exposure varies with journey purpose which we investigate in the next chapter.

5.4 Summary

The distribution of the accident statistics throughout the day was such that when measuring pedestrian activity for eventual comparison with the accident figures it was possible to divide the week into Monday to Thursday (grouped), Friday, Saturday and Sunday. Sunday was a day of very little pedestrian activity, both in terms of the proportion of people who did any walking and the amount of walking done by those who did some. This was true for both sexes and the two age groups. Friday and Saturday were days of high average pedestrian activity this being mainly due to the amount of walking done by people who did any on those days rather than the proportion of people who did no walking. Elderly people were involved in a noticeably greater amount of pedestrian activity on Fridays than on other days of the week.

On Sundays there was no difference between the two age groups in the proportion of people who did some walking while a greater proportion of men than women did some walking.

6 Journey characteristics and pedestrian activity

6.1 Introduction

The variation in pedestrian activity according to the characteristics of the journey in which the walking took place might not only be related to the differences in mean activity levels seen between the different days of the week as mentioned in the previous chapter but could also affect some of the variation in pedestrian activity with respect to different personal characteristics. In this section we shall look at both these variations but before we do the measures of pedestrian exposure require some re-examination.

Although, in theory, time should be a relatively good measure of exposure in practice it presents difficulties not experienced with the other measures used. This is primarily due to the fact that it was the only directly reported measure of exposure we have used and was, possibly, more likely to be affected by difficulties of estimation experienced by the informant. One of the main problems is the estimation of time spent walking while shopping since it is often difficult to divide the total time spent shopping into that spent outside and that spent inside the shops. Thus while the number of roads crossed and distance walked would not be affected the time spent walking would. One way of checking this is to compare the proportion of the total time spent walking which was spent walking for shopping purposes with the same proportion for the number of roads crossed and the distance walked (Table 6.1).

Table 6.1 Distribution of activity measures by purpose of journey

Purpose of journey	Number of roads crossed	Time spent walking (mins)	Distance walked (kms)
	%	%	%
Work or education	26	17	24
Shopping	37	47	36
Social or entertainment	23	19	23
Walks or trips	6	10	10
Other	8	7	7
	100	100	100
Base (total activity measure)	*63425*	*231889*	*13787*

The five divisions of purpose used in this table will be explained more fully in the next section as the comparison we are making here does not require a full definition for each group. It is of interest however to know that 'shopping' comprises any walking done going to the shops, around the shops and returning from shopping. It also includes any walking done in journeys to and from banks, hairdressers, garages and so on.

From Table 6.1 we can see that whereas the distributions for the number of roads crossed and the distance walked are broadly similar the distribution for time is very different. This difference arises mainly from the pedestrian activity associated with shopping journeys. Whereas 37% of all roads crossed were crossed on shopping journeys and 36% of the total distance walked was walked on shopping journeys, 47% of the time spent walking was spent in journeys for this purpose.

This higher proportion of time spent walking for shopping leads to correspondingly lower proportions spent walking on journeys for work or of a social nature. The differences between the time distribution and the road crossing and distance distributions are large enough to support the doubt that the time spent walking on shopping journeys includes some time which was actually spent inside the shops. However this may not be the only reason for the difference. A second possibility is that people do actually walk more slowly when they are on shopping trips. From general experience it seems likely that this factor could also make a contribution. Thus it is most likely that the time measurements were affected by a combination of the inaccurate exclusion of time spent in the shops and a genuinely slower pace of walking while on shopping journeys. There is no way of assessing the contribution due to each. For these reasons we have concentrated in the rest of this chapter on the analysis of the number of roads crossed and the distance walked.

6.2 Variation in pedestrian activity by journey purpose and personal characteristics

When the pedestrian activity information was collected each journey was divided into walking and non walking sections. The purpose associated with each section of walking was established by asking the informant what he considered to be the main purpose of the journey in which that section of walking took place. We have divided the different journey purposes into five main groups: work and education, shopping, social and entertainment, walks and trips, and other reasons. 'Work and education' includes journeys to and from work or a place of education and journeys in the course of work; 'shopping', as we stated previously, includes journeys to and from and around the shops and journeys to and from hairdressers, banks and so on; 'social and entertainment' reasons includes visiting friends, journeys to and from places of entertainment, restaurants and so forth and also travelling associated with sports; 'walks and trips' includes day trips, journeys to and from holidays, walks for pleasure and so on. The group entitled 'other' comprises three main types of journeys: escorted travel, journeys to do with voluntary work and those journeys which could not be classified into any particular type.

Having defined the content of these five main groups we now turn to look at how pedestrian activity was divided between them.

Table 6.2 Mean pedestrian activity by purpose of journey

Purpose of journey	Mean no of roads crossed per day	Mean distance walked per day (kms)
Work or education	2.3	0.47
Shopping	3.3	0.69
Social or entertainment	2.1	0.44
Walks or trips	0.6	0.19
Other	0.7	0.14
Base	*7120*	*7120*

Table 6.2 shows in terms of mean values what Table 6.1 showed in percentages and so we can see once again that the variation in mean values with respect to journey purpose was very similar for both exposure measures, the only slight difference being for journeys for the purpose of walks and trips. Calculation of a value of roads crossed per unit distance walked for each purpose shows that while for four of the purposes the value ranged between 4.8 and 5 roads per kilometre for walks and trips it was only 3.2 roads per kilometre suggesting, not unreasonably, that people choose to go for walks and trips in areas where there were not so many roads to cross.

Table 6.3 Mean pedestrian activity by journey purpose, age and sex

Purpose of journey	Age		Sex	
	18-59	60 and over	Male	Female
	Mean number of roads crossed per day			
Work or education	2.8	0.8	2.6	2.0
Shopping	3.3	3.1	2.1	4.3
Social or entertainment	2.3	1.5	2.3	1.9
Walks and trips	0.4	0.9	0.7	0.5
Other	0.8	0.4	0.3	1.0
All purposes	9.7	6.7	8.1	9.6
	Mean distance walked per day (kms)			
Work or education	0.59	0.16	0.57	0.38
Shopping	0.71	0.67	0.43	0.93
Social or entertainment	0.47	0.35	0.50	0.38
Walks and trips	0.15	0.30	0.24	0.14
Other	0.17	0.07	0.07	0.21
All purposes	2.08	1.55	1.82	2.04
Base	*5188*	*1932*	*3339*	*3781*

For unweighted bases see tables in Table Section

Returning to the mean values in Table 6.2 we see that people crossed more roads and walked farther for shopping than for any other purpose and crossed least roads and walked least far for walks and trips and 'other' reasons. Table 6.3 shows how these mean values varied with age and sex.

As one would expect, adults aged less than sixty crossed on average more roads and walked further for work purposes than those aged sixty and over and they also had a higher mean pedestrian activity level for journeys of a social or entertainment nature. In fact it was these two differences which accounted for the overall higher pedestrian exposure experienced by the younger adults. However people aged sixty and over did cross on average slightly more roads and walked slightly farther for walks and trips. When looking at the differences in pedestrian activity between the sexes it is interesting to note that although many more men go to work than women their average pedestrian exposure for these journeys was only slightly higher while women crossed more than twice as many roads as men for shopping and walked over twice as far. The women also had a higher mean exposure for what is here termed 'other' reasons which, as described above, includes escorting children and voluntary work.

Presenting the figures as we have in Tables 6.2 and 6.3 is useful in showing how the pedestrian activity associated with each purpose varied in its contribution to the overall mean, but it also leads to two questions. First, what proportion of each group was involved in any journeys for each of the purposes shown and second, what was the variation in exposure for those who were involved in the different types of journey? Table 6.4 provides the data to answer the first of these questions.

There were 44% of people who made at least one shopping journey on their sample day while 40% made at least one journey for social or entertainment reasons and 39% made at least one work journey. Among the younger adults 49% made at least one work journey compared to 14% of the elderly, (it must be remembered at this point

Table 6.4 Proportion of people who made at least one journey (not necessarily involving any walking) for the purpose specified

Purpose of journey	All persons	Age		Sex	
		18-59	60 and over	Male	Female
Work or education	39%	49%	14%	53%	28%
Shopping	44%	46%	40%	33%	54%
Social or entertainment	40%	44%	30%	44%	37%
Walks and trips	10%	9%	12%	12%	9%
Other	17%	21%	8%	17%	18%
Base	*7120*	*5188*	*1932*	*3339*	*3781*

For unweighted bases see tables in Table Section

Table 6.5 Mean pedestrian activity of people who made at least one journey (not necessarily involving any walking) for the purpose specified

Purpose of journey	Mean number of roads crossed per day				
	All persons	Age		Sex	
		18-59	60 and over	Male	Female
Work or education	5.8	5.8	5.5	5.0	7.1
Shopping	7.4	7.3	7.7	6.4	7.9
Social or entertainment	5.2	5.2	5.2	5.3	5.1
Walks or trips	5.6	4.7	7.5	5.7	5.4
Other	4.1	4.0	4.8	2.0	5.8

For bases see tables in Tables Section that these figures refer to an average day and thus include Saturdays and Sundays). Apart from walks and trips a greater proportion of adults aged less than sixty made at least one of all types of journey than those aged sixty and over. Over half of all men made at least one work journey compared to just over one in four women. However not suprisingly the situation was reversed for shopping journeys where 54% of women made at least one journey for this purpose compared with 33% of men.

These figures refer to all journeys including those in which there was no walking on the public highway and it is from this base that the average exposure measures presented in Table 6.5 were taken. For this table the number of roads crossed is used as the measure of pedestrian activity.

Once again shopping stands out as a journey purpose associated with a large amount of pedestrian exposure. People going shopping crossed on average 7.4 roads per day compared to 5.8 roads crossed by people doing work journeys, 5.6 roads crossed on walks and trips and 5.2 roads in journeys for social or entertainment purposes. Among the people who made these different journeys there was very little difference between the two age groups. Thus, whereas the overall figures showed that younger adults crossed on average far more roads during work journeys, we can see here that among those who made work journeys there was no difference between the two age groups in the average number of roads crossed. The only difference which did occur was among people who went out for walks and trips where old people who did this type of journey crossed 7.5 roads on average compared to adults aged less than sixty who only crossed 4.7 roads. Where differences between the sexes occurred it was always the women who crossed more roads, these differences being found among people who made work journeys, went shopping or who went out for what is here termed 'other' reasons.

We have looked previously at the variation in pedestrian activity with respect to other personal characteristics such as whether the informant was married or not and whether he was in employment or not. We saw at the end of that chapter that the combination of employment and marital status showed different associations with exposure for men and for women, and that high or low exposure is mainly associated with marital status for men while it is employment status that seems to be associated with the variation in pedestrian activity of women. Table 6.6 shows the internal variations of these overall mean values according to the purpose of the journeys in which the walking took place.

Looking first at the figures for men we can see that the number of roads crossed for work or education journeys varied with respect to marital status and, of course, with respect to employment status. However while the latter variation was to be expected the former was not. Having grouped the data according to age and whether there was a car in the household we found that within these groups there was no longer any difference between the average number of roads crossed by married men in employment and by men in employment who were not married. Married men in employment crossed fewer roads for shopping purposes than men in other groups (this was true for both age groups), while married men not in employment crossed more roads for walks and trips. However the largest differences are found in the numbers of roads crossed for social and entertainment journeys, where men who were not married crossed over three times as many roads as men who were married, regardless of whether they were in employment or not. In checking the subgroups of the under sixties and the elderly and those with a car in the household and those without we found this variation recurred for all groups. It would thus seem that this is the underlying factor which results in the overall variation seen.

Women in employment had a higher pedestrian activity level than those not in employment regardless of their marital status and it is immediately obvious from Table 6.6 why this is so. Apart from roads crossed in work or education journeys there are very few differences between the mean numbers of roads crossed for journeys of other purposes by women of different employment or marital statuses. Women in employment cross far more roads for work or education journeys than those not in employment, whatever their marital status, and it is this difference which accounts for the overall variation in exposure seen among women of different marital and employment statuses.

6.3 Variation in pedestrian activity by journey purpose and day of the week

Having seen how journey purpose affects pedestrian activity in relation to personal characteristics we now look at it with respect to day of the week. We have shown previously that very little pedestrian activity took place on Sundays whereas Fridays and Saturdays were days of high activity. As we said before it is presumably not the

Table 6.6 Mean number of roads crossed per day by purpose of journey and various personal characteristics

Purpose of journey	In employment				Not in employment			
	Married		Not married		Married		Not married	
	Male	Female	Male	Female	Male	Female	Male	Female
Work or education	2.9	4.2	4.2	4.1	—	0.1	2.8	0.2
Shopping	1.4	4.1	3.0	4.6	3.7	4.5	4.2	3.9
Social or entertainment	1.5	1.5	5.9	2.4	1.7	2.0	5.4	2.0
Walks or trips	0.5	0.2	0.3	0.8	1.4	0.7	1.1	0.3
Other	0.3	1.1	0.2	0.1	0.6	1.3	0.5	0.9
All purposes	6.6	11.2	13.6	12.0	7.4	8.7	13.9	7.3
Base	*2156*	*1272*	*457*	*448*	*500*	*1312*	*207*	*743*

Table 6.7 **Mean pedestrian activity by day of week and journey purpose**

Purpose of journey	Mon-Thur	Friday	Saturday	Sunday
	Mean number of roads crossed per day			
Work or education	3.0	2.8	0.9	0.3
Shopping	3.0	4.2	6.0	0.6
Social or entertainment	1.6	2.4	2.6	2.9
Walks or trips	0.5	0.5	0.6	0.8
Other	0.9	0.8	0.3	0.4
	Mean distance walked per day (kms)			
Work or education	0.63	0.58	0.17	0.06
Shopping	0.62	0.87	1.35	0.15
Social or entertainment	0.33	0.52	0.57	0.65
Walks or trips	0.18	0.14	0.16	0.30
Other	0.18	0.17	0.08	0.06
Base	*4000*	*1033*	*1037*	*1050*

For unweighted bases see Table Section

day of the week itself which caused these differences but rather what people did on these days (Table 6.7).

The variations in the mean number of roads crossed and the distance walked were again similar. As one would expect people crossed on average more roads and walked further for work purposes on week days than they did on Saturdays or Sundays and on Saturdays they crossed twice as many roads and walked twice as far for shopping as they did on an average Monday to Thursday. The combination of these two variations explains the low pedestrian activity found on Sundays, the broad generalisation, as we said previously, being that people crossed more roads going to work on week days, crossed more roads going shopping on Saturdays and then on Sundays did neither of these. They did, however, cross more roads and walked further for social and entertainment type journeys on Sundays than they did on an average Monday to Thursday.

When we were looking at the variation of pedestrian activity with age and day of the week we found that on average the elderly crossed a much larger number of roads on Friday than on any other day of the week. The last table in this section shows how these figures vary for the two journey purposes generally associated with the most pedestrian activity — work and shopping.

Table 6.8 **Mean number of roads crossed in work or shopping journeys by day of the week and age and sex**

Purpose of journey	Mon-Thur	Friday	Saturday	Sunday
	Age 18-59			
Work or education	3.8	3.4	1.2	0.2
Shopping	3.1	3.8	6.6	0.7
Base	*2920*	*744*	*752*	*772*
	Age 60 and over			
Work or education	0.9	1.3	0.2	0.3
Shopping	2.9	5.0	4.3	0.4
Base	*1080*	*289*	*285*	*278*

The high pedestrian activity found among the elderly on Fridays was mainly due to the variation in the number of roads crossed while shopping. Younger adults crossed about the same number of roads for shopping on a Friday as they did on an average Monday to Thursday and then crossed far more roads for this purpose on a Saturday. However, people aged sixty and over crossed on average about the same number of roads for shopping on Fridays and Saturdays and far fewer on Mondays to Thursdays. Thus, whereas for the younger adults the high exposure associated with shopping on Saturdays was counteracted by the low number of roads crossed for work purposes, this high exposure on Fridays for shopping among the elderly has no such counterbalancing low level of activity, and therefore stands out.

6.4 Variation in pedestrian activity according to the transport used throughout the day

Although this study was primarily concerned with pedestrian travel the amount people walk must obviously be related, to some extent, to the other forms of transport available. The only indicator of the overall variation in transport usage we have shown so far was the proportion of people who went out but did no walking which approximates reasonably to the group whose only journeys on their sample day must have involved some form of private transport. We now go on to look in a little more detail at the broad categories of transport used throughout the day.

As part of the questions concerning the sample day the informants were asked about the transport they had used for each journey. Due to the way in which this data was collected we feel that its reliability in relation to particular journeys is not as good as to the overall exposure measures, the accuracy of which was of course the main object of the design (see Appendix D). For this reason we look only at the different combinations of transport used during the whole day. The transport used has been divided into three different categories: 'foot', 'public' and 'private'.

For our purposes the division between 'public' and 'private' transport has been made on the basis of whether or not the individual had the control to join and leave the transport at will. Thus a train or bus was, of course, public transport because there are only certain points where the individual can join or leave them whereas a car or motor bike was private transport because it depends on the individual where he starts or stops. This definition is based on our interest in the amount of walking the individual has to do to reach the transport and leads to some slightly out of the ordinary groupings because by this definition a lorry driver in his lorry is in private transport and so is a person in a taxi.

Having defined the terms used we now go on to look at the variation in combinations of the three types of transport used throughout the day.

Table 6.9 Proportion of people using different combinations of transport throughout the sample day

Transport used throughout the day	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	%	%	%	%	%
Foot only	21	19	27	15	27
Foot and public	12	11	14	9	14
Foot and private	29	34	17	37	23
Foot, public, private	8	9	3	6	9
Public only	—	—	—	—	—
Private only	16	18	10	22	10
Public and private	—	—	—	—	—
Did not go out on sample day	12	8	21	9	14
Cannot go out on foot	2	1	8	2	3
	100	100	100	100	100
Base	*7120*	*5188*	*1932*	*3339*	*3781*

For unweighted bases see tables in Table Section

Looking first at the figures for the whole sample we see that on an average day one fifth of the adult population used walking as their only method of conveyance. The most frequently used combination of transport was walking together with private transport which was used by 29% of people. The figures showed that public transport was always used in combination with some amount of walking on the public highway while, as we have already suggested, there was indeed a group of people (16%) who used private transport only and did not walk at all.

Among the elderly 27% used walking as their only mode of conveyance on an average day compared to 19% of adults aged less than sixty. Far more of this latter group used private transport both in combination with walking and without. There is no difference between the age groups in the use of public transport. The difference in people using walking as their only form of transport is even more noticeable between men and women, 15% of men come into this group compared to 27% of women. Twice as many men as women use private transport only and about one and a half times as many men as women use a combination of private transport and walking. Slightly more women use public transport.

Table 6.10 Mean pedestrian activity by combination of transport used throughout the sample day

Transport used throughout the day	Mean no of roads crossed per day	Mean distance walked per day (kms)
Foot only	12.7	2.79
Foot and public	17.8	3.94
Foot and private	9.8	2.10
Foot, public, private	16.1	3.93

For bases see tables in Table Section

Having seen how the different combinations of transport used throughout the day varied according to age and sex we now look at the variation in pedestrian activity according to the types of transport used.

People who used both walking and public transport as methods of conveyance on their sample day crossed far more roads and walked further than those who did not use public transport, while those who used a combination of foot and private transport during the day experienced the least pedestrian exposure. Further investigation of the characteristics of the people who used, and the journeys involving, public transport revealed no underlying factors which might explain the high pedestrian activity associated with public transport. It can thus only be suggested that this large amount of walking is the result of several unmeasured factors, one being that when using public transport one has to walk a predetermined distance most probably along the public highway, first in order to reach the bus stop or station and second to reach the actual destination after leaving the public transport.

6.5 Variation in the numbers of roads crossed alone and with other people

We have seen that pedestrian activity in terms of the number of roads crossed, the time spent walking and the distance walked varies with respect to different personal characteristics, day of the week, the purpose of the journey and the other types of transport used throughout the day. In this section, rather than looking at the relationship of another variable to exposure, we have investigated a slightly different measure of pedestrian activity, that is the number of roads crossed alone, to see how this related to some of the variables mentioned above.

It is possible that people out walking alone could be more at risk of being involved in a pedestrian accident than those who are not alone. For example, an individual who is alone has more opportunity to make an impulsive decision to cross the road, or one person may not be so visible to the motorist as a group of two or more.

From the method of collection of the data we could only ascertain whether the informant was with someone he knew or not and there is obviously a probability that in

Table 6.11 Comparison of the mean number of roads crossed unaccompanied and the overall mean number of roads crossed

	Mean no of roads crossed unaccompanied (a)	Mean no of roads crossed overall (b)	$\frac{(a)}{(b)} \times 100$
All persons	5.5	8.9	61%
Age			
18-59	5.8	9.7	59%
60 and over	4.7	6.7	70%
Sex			
Male	5.4	8.1	67%
Female	5.5	9.6	57%

For bases see Table Section

some cases where he has been classified as being on a journey alone he in fact crossed roads at the same time as other people, such as crossing at traffic lights where pedestrians accumulate while waiting to cross. The information regarding whether people were alone or not related to groups of roads rather than each individual road (see Section 2.3). Since we were dealing with fairly small groups of roads people generally either had company with them for all the roads crossed in that group or for none of them. However, 5% of the roads were crossed in walking sections where the person was accompanied for only some of the roads crossed. The following tables cover only those roads crossed for which accompaniment was known (ie 95% of the roads crossed). Therefore, the figures presented here are very slight underestimates.

The first column in Table 6.11 shows that people crossed on average 5.5 roads per day when alone. Younger people crossed more roads alone than older people but there was no difference between the average number of roads crossed alone by men and by women. In comparing the numbers of roads crossed alone with the number crossed overall we found that older people crossed a greater proportion of roads when alone than younger people did and men crossed a greater proportion of roads alone than women did. As we found that men and old people crossed a greater proportion of roads when alone it is no suprise to see that men in the older age group cross the greatest proportion of roads alone (Table 6.12).

Table 6.12 Comparison of mean number of roads crossed in sections walked alone with overall mean number of roads crossed for age together with sex

	Mean no of roads crossed unaccompanied (a)	Mean no of roads crossed overall (b)	$\frac{(a)}{(b)} \times 100$
Men aged			
18-59	5.3	8.3	64%
60 and over	5.8	7.6	77%
Women aged			
18-59	6.2	11.1	56%
60 and over	3.8	6.0	63%

For bases see Table Section

There was very little difference between men aged less than sixty and women aged sixty and over in the proportion of roads crossed alone while women aged less than sixty crossed the smallest proportion of roads when alone. This last figure is fairly easily explained by the fact that younger women were the group who were the most likely to be out with children and the figures in Table 6.13 confirm this.

Table 6.13 Comparison of mean number of roads crossed in sections walked entirely with a child with overall mean number of roads crossed for age together with sex

	Mean no of roads crossed with a child (a)	Mean no of roads crossed overall (b)	$\frac{(a)}{(b)} \times 100$
Men aged			
18-59	0.5	8.3	6%
60 and over	—	7.6	—
Women aged			
18-59	2.1	11.1	19%
60 and over	0.2	6.0	3%

For bases see Table Section

Of the roads crossed by women aged less than sixty 19% were crossed with children compared to only 6% of those crossed by men aged less than sixty and 3% of those crossed by women aged sixty or over. (These figures are again slight underestimates as roads crossed in sections where the named person was accompanied for part of the time have been excluded.)

Further investigation of the variation in the number of roads crossed when alone with respect to other personal and journey characteristics revealed no relationship of relevance to the differences in the accident statistics.

6.6 Summary

Two variables relating to the actual travelling were considered, these being journey purpose and transport used throughout the day. In measuring pedestrian activity the time measurement was omitted because of the difficulties of excluding time spent in shops during shopping journeys. Shopping was in fact the journey purpose associated with the most pedestrian activity. On an average day 44% of people made at least one shopping journey (which did not necessarily involve any walking) while on average 3.3 roads out of a total of 8.9 were crossed while shopping. Among the elderly shopping accounted for nearly half their pedestrian activity. Men crossed slightly more roads and walked slightly further for work and education journeys than for shopping journeys. However, among men who were not married the most roads were crossed in journeys for social and entertainment reasons. When looking at journey purpose in relation to day of the week it was found that the elderly had a high exposure on Fridays because they crossed more roads and walked further for shopping purposes.

One fifth of all people used walking as their only mode of conveyance on their sample day. Just over one in five men used private transport only on an average day and did no walking at all along the public highway, while this was true for only one in ten women and one in ten people aged sixty or more. Slightly more women than men used some public transport on an average day but there was no difference in use between the under sixties and those aged sixty and over. A combination of public transport and walking (with or without private transport) used throughout the day was associated with a high level of pedestrian activity.

Finally in this chapter we investigated briefly the variation in the number of roads crossed when alone, that is on a journey that was unaccompanied. Of all roads crossed 61% were crossed when alone. Men aged sixty and over crossed the greatest proportion of roads alone, but further investigation revealed no significant departure from the overall variation seen.

PART II

Pedestrians—their circumstances, attitudes and behaviour

7 Health and getting about on foot

7.1 Introduction

We have concentrated in the first part of this report on the variation in the amount of pedestrian activity experienced by different groups of people, first in order to study this variation *per se*, and second to produce results for the calculation of pedestrian accident risks. Although it is likely that pedestrian exposure might in some way be related to pedestrian accidents, there are of course other variables which could possibly play a part. Included among these are the variation in pedestrian behaviour (as distinct from activity) and the pedestrians' attitudes in general. There is also the possibility that these variables themselves may be related in some way to pedestrian exposure.

In addition to collecting the detailed exposure information during the interview we also ascertained other information concerning the informant's behaviour and attitude as a pedestrian. The informants were asked about any difficulties they might have in getting about on foot, their behaviour as pedestrians and their opinions of other road users and the state of roads themselves. We now turn to look at the first of these topics: any difficulties the informant had in getting about.

7.2 Health problems and pedestrian activity

One topic which is obviously of relevance to the ease with which people get about on foot is their health. It is possible to introduce a large amount of detail into questions about people's health problems but since we were intending to collect very detailed information about their pedestrian activity it was felt that the health questions should be couched in very general terms. The informants were asked if they had any problems with their eyesight, hearing, walking or any other health problems. If they felt that they did have some problem they were then asked whether it limited the amount they went out. Once again it must be stressed that any health problems mentioned or, for that matter, not mentioned and their associated limitations were purely in the opinion of the informant, and no other check was made.

Table 7.1 shows how pedestrian activity as measured by the survey varied according to the presence of a health problem which the informant considered limited his ability to get about on foot.

As one might expect, the distribution of overall pedestrian exposure among people who said that they had a health problem which limited their mobility was very different from that of those people who either had no health problems or had health problems which they did not consider limited the amount they went out. Among people with limiting health problems 19% could not go out on foot and a further 30% did not go out on their sample day. Thus about one in two people with health problems which limited their mobility did not go out on their sample day. This was so for only 9% of the people with no limiting health problems, but 17% of them went out and did no walking on the public highway. Even when the people with limiting health problems did go out fewer of them crossed as many roads as those people with no limiting health problems.

Table 7.1 Distribution of overall pedestrian activity by the existence of limiting health problems

Overall pedestrian activity	Has health problems which limit mobility	Has no limiting health problems
	%	%
Could not go out on foot	19	
Did not go out on sample day	9	9
Went out but did no walking	9	17
Walked, crossed 0-9 roads	28	36
Walked, crossed 11 or more roads	14	38
	100	100
Base	*894*	*6155*

We now go on to see how these results vary with age and sex (Table 7.2).

Looking first at the differences between the two age groups we can see that among people who classified themselves as having health problems which limited their mobility a smaller proportion of elderly people went out on an average day. Among people with limiting health problems 22% of those aged sixty and over could not go out on foot at all compared with 13% of the younger adults, while 34% of the elderly in this group did not go out on their sample day compared with 21% of the younger adults. A greater proportion of the elderly than of the younger adults with no limiting health problems did not go out on their sample day while more of the adults aged less than sixty went out but did no walking. Thus it would appear that other factors as well as health problems contribute towards the difference in the amount of pedestrian activity experienced by the younger adults and the elderly.

Among people who said they had a health problem which limited their mobility there was no difference between the proportion of men and women who could not go out on foot but a greater proportion of women in this group did not go out on their sample day. Among the group with no limiting health problems a far greater proportion of men went out but did no walking on an average day and more women than men cross a large number of roads. These

Table 7.2 **Distribution of overall pedestrian activity by limiting health problems, age and sex**

Overall pedestrian activity	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	Has some health problems which limit mobility				
	%	%	%	%	%
Could not go out on foot	19	13	22	20	19
Did not go out on sample day	30	21	34	23	34
Went out but did no walking	9	11	8	9	8
Walked, crossed 0-9 roads	28	31	26	29	27
Walked, crossed 11 or more roads	14	24	10	19	12
	100	100	100	100	100
Base (people with limiting health problems)	*894*	*254*	*640*	*293*	*601*
	Has no health problems which limit mobility				
	%	%	%	%	%
Could not go out on foot	—	—	—	—	—
Did not go out on sample day	9	7	15	8	10
Went out but did no walking	17	18	11	24	10
Walked, crossed 0-9 roads	36	36	41	37	36
Walked, crossed 11 or more roads	38	39	33	31	44
	100	100	100	100	100
Base (people with no limiting health problems)	*6155*	*4912*	*1243*	*3020*	*3135*

figures for the two sexes once again demonstrate that greater car usage by men leads to a reversal in the exposure patterns. Thus among the group with limiting health problems which comprised mainly older people who were less likely to own cars, slightly more men did some walking on an average day while among the group with no limiting health problems who were, on the whole, younger and therefore more likely to own cars, more women than men did some walking.

Having seen how pedestrian activity varied with whether people considered they had a health problem which limited their mobility we now go on to look at the variation which occurred with respect to the three specified health problems. It was not possible in this piece of analysis to look only at those problems which the informant felt limited his mobility because of the way the question was asked so, we looked at all degrees of the three specified health problems. It must also be noted that people could, of course, be included in more than one category.

Table 7.3 **Distribution of overall pedestrian activity by three specified health problems**

Overall pedestrian activity	Has problems with:		
	Eyesight	Hearing	Walking
	%	%	%
Could not go out on foot	8	8	17
Did not go out on sample day	21	21	25
Went out but did no walking	8	8	9
Walked, crossed 0-9 roads	30	34	31
Walked, crossed 11 or more roads	33	29	18
	100	100	100
Base	*940*	*658*	*948*

It is not particularly surprising to see that the largest proportion of people who could not get out on foot was found among those people who had problems with their walking. In fact, 17% of people who have walking problems could not go out on foot compared to only 8% of the people with eyesight problems and hearing problems. Among people in the latter two groups the results for all categories were very similar.

7.3 Difficulties in crossing the road

Not all difficulties in getting about on foot are due to health problems so to establish what prominence people gave to health problems compared to other factors which make travelling on foot difficult, the informants were asked whether they had any particular difficulties crossing the road and, if so, what made it difficult.

The question was asked in such a way to imply particular personal difficulties rather than any general difficulties the pedestrian faces in crossing the road and 16% of all people said they did have some difficulty in crossing the road. Nearly a quarter of all people aged sixty and over said this compared to only 13% of those aged less than sixty. Only 10% of men said they had any difficulty in crossing the road compared to 20% of women.

The answers to the question 'What makes crossing the road difficult?' indicated that in general more people were worried about the traffic and other aspects of the road than they were about their own particular difficulties. This was more often the case for the adults aged less than sixty among whom 75% of those who found crossing the road difficult said it is because of the traffic and roads generally while relatively few people mention-

Table 7.4 **Do you yourself have any particular difficulties with crossing the road or not?**

Do you yourself have any particular difficulties with crossing the road or not?	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	%	%	%	%	%
Could not go out on foot	2	1	7	2	3
Has difficulties crossing road	16	13	23	10	20
Does not have difficulties	82	86	70	88	77
	100	100	100	100	100
Base	*7120*	*5188*	*1932*	*3339*	*3781*

Table 7.5 What makes crossing the road difficult?

What makes it difficult?	All persons	Age		Sex	
		18-59	60 and over	Male	Female
Problems with eyesight	8%	4%	14%	6%	9%
Problems with hearing	2%	—	4%	—	3%
Problems with walking	10%	3%	21%	9%	11%
Other health problems	19%	14%	28%	16%	21%
Traffic and roads generally	65%	75%	50%	69%	64%
Other factors mentioned	5%	5%	5%	2%	7%
Base (people who had difficulties)	*1114*	*674*	*440*	*343*	*772*

ed any problems with health. Among the elderly who found road crossing difficult there were more answers concerning health problems than concerning the traffic and roads.

As we had already asked the informants what health problems they felt they suffered from it is possible to compare the distributions from the two answers. The last table in this section shows for people aged sixty and over who could go out on foot the proportion who said they suffered from specific health problems and the proportion who mentioned health problems in connection with road crossing difficulties. Although one would not expect the two sets of proportions to be the same it is interesting to note that when mentioning their health problems, approximately the same proportions of elderly people said they had problems with their eyesight and hearing but that when talking about difficulties with crossing the road a much smaller proportion mentioned hearing than mentioned eyesight problems. It could be that the importance of being able to hear well when crossing the road is not recognised which might be a contributory factor to the higher proportion of the elderly being involved in pedestrian accidents.

Table 7.6 Comparison of specific health problems mentioned with some of the road crossing difficulties for people aged sixty and over

Health problems mentioned	People aged sixty and over who could go out and who:	
	Mentioned specific health problems	Said they had difficulty crossing the road
Problems with eyesight	24%	14%
Problems with hearing	21%	4%
Problems with walking	32%	21%
Base	*1788*	*440*

7.4 Summary

When people were asked in very general terms about their health problems and any associated limitations it was found, not surprisingly, that those who said their mobility was limited by their health problems did in fact have less pedestrian exposure as measured by the survey. The differences in pedestrian activity between those with limiting problems and those without were more pronounced among the elderly. The overall difference in the amount of pedestrian activity between the older and younger adults seen previously was repeated among both the group with limiting health problems and the group without. This indicated that there was some other factor or factors which lead to adults aged less than sixty walking more than those aged sixty and over. There were 16% of people who said they had particular difficulties when crossing the road. Of these people 65% said their difficulties were due to the traffic and roads generally while the others mentioned health problems. From a combination of results it seems possible that the importance of being able to hear well when crossing the road is not recognised by the elderly.

8 Dangers on the road and pedestrian behaviour

8.1 Road users' behaviour

It is possible that some road accidents happen as the result of frustration and annoyance experienced by different road users which leads to them making ill considered decisions. Often it is easier for people to see mistakes made by other people than to see them in themselves, so we asked the informant what he thought were things drivers do that annoy pedestrians, and then what things pedestrians do that annoy drivers.

Table 8.1 The five most frequently mentioned annoying things which drivers and pedestrians do

	All persons	Age		Sex	
		18-59	60 and over	Male	Female
What kinds of things do you think drivers do that annoy pedestrians?					
Do not give way at crossings	39%	44%	25%	39%	39%
Do not give way elsewhere	16%	16%	19%	16%	16%
Drive too fast	22%	20%	28%	21%	23%
Do not give adequate signals	10%	12%	5%	9%	11%
Splash through puddles	9%	11%	6%	11%	8%
What kinds of things do you think pedestrians do that annoy drivers?					
Step into road without looking	53%	56%	44%	53%	53%
Dither/hesitate when crossing	14%	13%	15%	13%	14%
Step onto pedestrian crossing without waiting	21%	24%	13%	21%	20%
Misuse pedestrian crossings	12%	13%	11%	16%	9%
Do not use pedestrian crossings	13%	13%	13%	14%	13%
Base	*7120*	*5188*	*1932*	*3339*	*3781*

The most frequently mentioned source of annoyance for pedestrians was that drivers do not give way at pedestrian crossings which was mentioned by 39% of all people. The fact that drivers drive too fast was mentioned by 22% of people, while 10% complained that drivers do not give adequate signals. The first four most frequently mentioned annoyances could be considered dangerous in their own right and not only as a source of irritation, but the fifth was on a somewhat different level. There were 9% of people who said that drivers annoy pedestrians by splashing through puddles.

A much greater proportion of adults aged less than sixty than of those aged sixty and over mentioned that drivers do not give way at pedestrian crossings (44% compared to 25%) which suggests that drivers might tend to give way to elderly people more often than to younger adults. The only annoyance mentioned by a greater proportion of elderly people was that drivers drive too fast. There were very few differences between the proportions of men and women mentioning any of the items that annoyed pedestrians.

In answer to the question 'What kinds of things do you think pedestrians do that annoy drivers?' one annoyance was mentioned by over 50% of people, this being that pedestrians step into the road without looking. It is interesting that a large number of people mentioned this since a large proportion of pedestrian accidents take place on the nearside of the road, ie, in many cases when the pedestrian has just stepped into the road. The second most frequently mentioned annoying thing that pedestrians do was stepping out onto a crossing without looking or giving the driver adequate time to stop. This being so then it might provide part of the reason why drivers do not give way to pedestrians at crossings (the most frequently mentioned annoying thing which people said drivers do), because they do not have time to stop. It is interesting that a much greater proportion of younger adults than older people mentioned that drivers do not give way at crossings and, similarly, a greater proportion of younger adults also mentioned that the pedestrians step out on to crossings without giving the driver time to stop. Two other annoying things connected with pedestrian crossings were mentioned, one being that the pedestrian misuses crossings in ways other than those already mentioned and the other that pedestrians do not use them at all. Apart from differences already mentioned the frequency of the answers to this question were very similar for the old and the younger adults and the two sexes. Further analysis of this question by whether the informant held a driving licence or not revealed no new variations.

As well as asking the informant to consider in general the annoying things the pedestrians and drivers do we also asked three more personal questions relating to his own behaviour as a pedestrian. Firstly how he compared his normal walking speed with that of other people, secondly whether he tended to cross the road diagonally or not and thirdly whether he thought he crossed the road in a rash or cautious manner.

Table 8.2 Comparison of walking speed with that of other people

When you are walking by yourself along a pavement would you say that you walk...	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	%	%	%	%	%
Faster than other people	42	49	21	44	39
About the same	41	42	40	41	42
Slower than other people	15	8	32	13	16
Cannot go out on foot	2	1	7	2	3
	100	100	100	100	100
Base	*7120*	*5188*	*1932*	*3339*	*3781*

Most people considered that they walk either faster or about the same as other people. Only 15% considered that they walk more slowly. Not suprisingly a much larger proportion of adults aged less than sixty than of those aged sixty and over considered that they walk faster than other people. Almost a third of the elderly consider that they walk slower than other people. If the elderly do in fact walk more slowly than other people then they will take longer crossing the road which could be one indication of a reason why more old people are involved in pedestrian accidents, although it is possible that if they realise they do walk more slowly then perhaps they may take more care.

Whether people cross the road diagonally or not can serve as an indicator both of their attitude towards road crossing and also, to some extent, of their exposure to risk in that people who cross diagonally presumably spend more time in the road. Table 8.3 shows that one in three people consider that they never cross the road diagonally while 24% said that they cross the road diagonally very or fairly often. The differences between the two age groups were much as one would expect, with 53% of the elderly saying they never cross the road diagonally compared with only 27% of the adults aged less than sixty. There was very little difference between the distributions of answers for men and women.

When asked with what degree of cautiousness or rashness they cross the road 36% of people said that they are very cautious, 27% said they are rather cautious and 32% considered themselves to cross in an average fashion. It is perhaps not surprising that very few people said that when crossing the road they are rash since such an answer would essentially be a self-criticism of the person's own pedestrian behaviour. This is not to say, however, that the proportion of pedestrians who are, in fact, rather rash or very rash would be as low as this if assessed from an independent standpoint!

A much greater proportion of elderly people than of younger adults said they cross the road very cautiously. There seems to be a slightly greater trend towards cautiousness among women than among men but the differences are not really large enough to draw any conclusions about accident risks.

8.2 Dangers on the road

Obviously the different types of behaviour of road users are only one possible cause of accidents and there are many other sources of danger for the pedestrian. In order to establish what people recognise as dangers they were asked three questions. Firstly we asked in general what things the informant thought made roads dangerous. It is often difficult to consider the answers to general questions such as these, so to prompt the informant further we asked if he knew of a particular danger spot. If he did, he was then asked what made this place dangerous. The answers to the general and the particular questions were categorised using the same list of codes and it is interesting to see the variation which occurred. Table 8.4 shows the five most frequently mentioned sources of danger on the roads. For the purposes of defining the most frequently mentioned dangers the answers to the

Table 8.3 How do people consider that they cross roads

	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	%	%	%	%	%
Would you say that you cross diagonally					
.. very or fairly often	24	29	11	26	22
not very often	40	43	29	39	40
not at all	34	27	53	33	35
cannot go out on foot	2	1	7	2	3
	100	100	100	100	100
Would you describe yourself when crossing the road as ...					
.. very cautious	36	30	49	32	38
rather cautious	27	29	22	28	27
average	32	36	21	35	30
rather rash or very rash	3	4	1	3	2
cannot go out on foot	2	1	7	2	3
	100	100	100	100	100
Base	*7120*	*5188*	*1932*	*3339*	*3781*

general and particular questions were looked at together and the give largest groups were selected.

When people were asked what things make roads dangerous for pedestrians only 5% mentioned junctions compared to 33% who described a particular danger spot as being at a junction. The most frequently mentioned sources of danger from the general question were parked vehicles and the speed of the traffic which were both mentioned by 17% of people. Lack of pedestrian facilities and the volume of traffic were the other most frequently mentioned sources of danger. From the methodological viewpoint it is interesting to note that the answers to the question concerning the particular danger spot were more clustered than the answers to the general question, resulting from the same answers being given by more people for the particular question than for the general question. Another interesting point that arose from looking at the questions in this way was that ordering the groups in size for the answers to the general question produced an almost reverse order for the question about a particular danger spot.

Table 8.4 The five most frequently mentioned sources of danger on the roads for pedestrians

What kinds of things do you think make roads dangerous for pedestrians?	Roads in general	Particular danger spot
Parked vehicles	17%	11%
Speed of traffic	17%	26%
Lack of pedestrian facilities	15%	24%
Volume of traffic	11%	28%
Junctions	5%	33%
Base	*7120*	*7120*

8.3 Road crossing today and five years ago

We have looked in the previous chapter at how peoples' health affected their getting about on foot, and in this chapter at what they thought about other road users and their own pedestrian behaviour, and what makes roads dangerous.

All these factors contribute to the ease with which people can get about on foot on the public highway and many of them change over time, either for the individual or for society in general. So in this last section we look at the results of the question which asked people to compare road crosing today with five years ago.

More people said they found it harder to cross the road nowadays than five years ago, 57% said this compared to 13% who said it was easier. There was no difference in the proportions of older and younger adults who found it easier to cross the road and very little between the proportions who found it harder, although, if one takes some account of the proportion who could not go out on foot at all at the time of the survey (presumably five years ago some of these people could go out on foot) then there would have been a difference between the older and younger adults in the proportion who found road crossing harder. There was very little difference between the distributions for men and for women.

Having found very little difference in the proportions of old and young adults and of men and women who found it either easier or harder to cross the road nowadays we now go on to see if the reasons they gave differed.

Table 8.5 Comparison of road crossing today with five years ago

Comparing nowadays with five years ago do you find that for you road crossing is generally...	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	%	%	%	%	%
Easier now	13	13	13	12	14
The same	28	30	21	30	25
Harder now	57	56	59	56	58
Cannot go out on foot	2	1	7	2	3
	100	100	100	100	100
Base	*7120*	*5188*	*1932*	*3339*	*3781*

Table 8.6 Some of the ways in which crossing the road is easier

In what ways is it easier?	All persons	Age		Sex	
		18-59	60 and over	Male	Female
More pedestrian facilities	74%	71%	80%	70%	76%
Re-routing of traffic	15%	16%	11%	17%	13%
Change of circumstances	11%	13%	4%	9%	16%
Informant older/wiser	7%	9%	2%	11%	4%
Base (people who find road crossing easier)	*916*	*670*	*246*	*393*	*523*

Table 8.7 Some of the ways in which crossing the road is harder

In what ways is it harder?	All people	Age		Sex	
		18-59	60 and over	Male	Female
Increased volume of traffic	89%	90%	86%	90%	89%
Traffic travels faster	28%	28%	25%	26%	28%
Larger vehicles on road	12%	12%	12%	12%	12%
Informant older/ill health	12%	6%	28%	14%	11%
Base (people who find road crossing harder)	*4058*	*2920*	*1138*	*1861*	*2197*

Tables 8.6 and 8.7 show the four most frequently mentioned reasons for road crossing being easier or harder nowadays than it was five years ago. In both cases there was one reason given by the majority of the people asked.

Among those people who found crossing the road easier nowadays 74% said it was because there were more pedestrian facilities such as pedestrian crossings, subways, refuges and so on. This was mentioned by as many as 80% of people aged sixty or more. Among the group of people who found crossing the road harder nowadays, 89% said that this was because of the increased volume of traffic while 28% said that the traffic travels faster nowadays. Among both groups of people there was, in fact, very little variation with respect to age and sex in the proportions who gave any of the different reasons with one exception: that the informant was older or suffered more from ill health nowadays. Not suprisingly this was mentioned by far more people aged sixty and over than those aged less than sixty (28% and 6% respectively).

Thus more than 50% of people thought that crossing the road had grown harder over the last five years, and there was very little difference between the younger and older adults or between men and women in the proportions who thought this. Nor was there any difference in the reasons given, with the exception of the informant being older or in ill health.

8.4 Summary

When asked about how drivers behave, the most annoying thing that people thought drivers do was not giving way at pedestrian crossings and the most annoying thing that pedestrians do was stepping out into the road without looking and secondly stepping onto a crossing without looking. More younger adults than elderly people mentioned that drivers do not give way at crossings, and more of this age group mentioned the two main annoyances pedestrians cause suggesting perhaps that it is the younger adults who step out onto crossings without giving the drivers a chance to give way.

One in three people said they never cross the road diagonally, while 24% admitted to crossing diagonally very or fairly often. Over a half of the elderly said they never cross the road diagonally and almost a half said they cross the road very cautiously. This compared with only 27% of the younger adults who said they never cross the road diagonally and 30% who said they cross the road very cautiously.

When asked in general what made roads dangerous the most frequently mentioned dangers were parked vehicles (17%) and the speed of traffic (17%) but when asked about a particular danger spot 33% of informants mentioned junctions compared to only 5% who mentioned junctions in answer to the first question.

Over 50% of all people thought that crossing the road was more difficult at the time of the survey than it was five years earlier and for this these people mainly blamed the increased volume of traffic.

9 Pedestrian road crossing facilities

9.1 Introduction

As the roads have become busier over the years various facilities for improving the safety of pedestrians while crossing the road have been developed. These facilities tackle the problem in different ways; one being to provide a means of crossing which separates the pedestrian from the traffic such as a footbridge or subway, and another being the provision of means to stop the traffic such as Zebra or Pelican crossings.

The Zebra crossing has been in use for many years while the Pelican is a fairly recent development, its predecessor being pedestrian traffic lights. The main innovation of the Pelican crossing is the introduction of a flashing light. This signal indicates that any pedestrian on the crossing has right of way but if the crossing is clear vehicles can go ahead. It has been introduced to prevent the unnecessary build up of traffic which used to occur at the older type of pedestrian signals. Since Pelican crossings were introduced there has been some debate about which of these two very different types of pedestrian crossing is preferable; whether it is the Zebra which is more familiar and perhaps more straightforward in its use or the Pelican which has been designed with the present day traffic problems in mind. One of the main worries about the Pelican crossing has been whether the general public understand the meaning of the different signals and this survey presented an opportunity to investigate this problem.

During the course of the interview the informants were asked about both Zebra and Pelican crossings. The questions on Zebra crossings concerned the use of them and what the informant thought were the good and bad things about them. As the Pelican crossing was a less familiar sight at the time of the survey the informants were asked if they had ever seen or used one. If they did not understand the term 'Pelican crossing' the interviewer explained what it was in as much detail as possible without mentioning the meaning of the different signals. If the informant has seen or used one of these crossings he was asked what he thought the good and bad things about them were, whether he preferred Zebra or Pelican crossings and why he did so, and lastly what he thought the different signals meant. The signals were described as the 'red man', the 'green man' and the flashing 'green man' and the informant was shown a picture card to illustrate these descriptions. All these questions were asked only of the people who were able to go out on foot.

Part of the observation of the roads crossed concerned the use of pedestrian facilities. The use of pedestrian crossings is discussed in Chapter 12 in conjunction with the occurrence of pedestrian accidents. If the informant has crossed the road via a footbridge or subway this was recorded but very few people were found to have done this, so these facilities have been omitted from the analysis.

9.2 Use of Pelican crossings

Pelican crossings have, as we said, been developed comparatively recently and consequently at the time of the fieldwork (1975) they were not in use all over Britain. We start this chapter by looking at which informants said they had actually used a Pelican crossing and which had seen them (Table 9.1). The first column shows that two thirds of all people who were able to go out on foot said that they had used a Pelican crossing and a further 15% said they had seen but not used one.

When looking at this variation with respect to age, 72% of people under sixty who were able to go out on foot said they had used a Pelican crossing compared with 51% of the sixty year olds and over. There was no difference between men and women in the proportions having used Pelican crossings but more men than women said that they had seen but not used them. We now go on to look at the variation in the use of Pelican crossings by whether informants helds a current driving licence or not (Table 9.2).

A greater proportion of people who held driving licences said they had seen or used Pelican crossings than of those who did not hold a licence; the proportions being greater both for those who had seen but not used a Pelican crossing and for those who had actually used one. It seems

Table 9.1 Use of Pelican crossing by age and sex

Use of Pelican crossing	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	%	%	%	%	%
Not seen or used	19	13	34	15	22
Seen not used	15	15	15	20	11
Used	66	72	51	65	67
	100	100	100	100	100
Base (people who can go out on foot)	*6944*	*5156*	*1788*	*3282*	*3662*

Table 9.2 Use of Pelican crossing by whether informant holds a driving licence

Use of Pelican crossing	Holds current driving licence	Does not hold current driving licence
	%	%
Not seen or used	10	26
Seen not used	19	12
Used	71	62
	100	100
Base (people who can go out on foot)	*3263*	*3648*

likely that the first difference arises from the greater mileage drivers cover and the greater possibility, therefore, of them seeing a Pelican crossing while the second could have been reflecting the age distribution within the two groups. However, an examination of these figures for the different age groups showed little or no reduction in the overall variation already seen.

9.3 Advantages and disadvantages of Pelican crossings

The informants who had seen or used a Pelican crossing were asked what they thought were the 'good things' about them from the pedestrian's point of view and what they thought were the 'bad things'. Table 9.3 shows which advantages and disadvantages were mentioned and by what proportion of people.

Of the people who had seen or used a Pelican crossing 56% thought that one of their advantages was that the pedestrian's right of way and the motorist's right of way was well defined so that both sets of road users knew who had priority. The next most often mentioned advantage was that the pedestrian had control over the traffic but this was only mentioned by 17% of the people. Of those who had seen or used a Pelican crossing 11% thought that they had no advantages at all. When asked what they thought were the bad things about Pelican crossings, 40% of people said there were no bad things which compares favourably with the 11% who said they had no good points. However, 24% said that Pelican crossings did not give people enough time to cross and 14% thought that Pelican crossings were confusing.

Fewer elderly people said that a good point of the Pelican crossing was that it gives clearly defined priorities to the pedestrian and the driver as did fewer elderly people mention that the pedestrian has control, but there was no difference in the proportions of older and younger adults who thought there were no advantages of Pelican crossings. However, a much greater proportion of elderly people said that there were no disadvantages of Pelican crossings: 48% as compared with 38% of the younger adults. Fewer of the people aged sixty and over thought that Pelican crossings do not give people enough time to cross the road and fewer of them thought that Pelican crossings are confusing.

More men than women mentioned that the Pelican crossing clearly defines who has priority while slightly more women than men said that there were no advantages of Pelican crossings. There was no difference, however, in the proportions of men and women who said there were no disadvantages of Pelican crossings. The only disadvantage which was mentioned by a varying proportion of men and women was that of there not being enough time to cross which 28% of women said compared with 19% of men.

Although the informants were asked to think of good and bad points of the Pelican crossing from the pedestrian's point of view, their answers could have been influenced by whether they were drivers or not. It was also likely that people's usage of the crossing affected their answers so we look at these two points in Table 9.4.

Table 9.3 Advantages and disadvantages of Pelican crossings

	All persons	Age		Sex	
		18-59	60 and over	Male	Female
From the pedestrian's point of view what do you think are the good things, if any, about Pelican crossings?					
Well defined priority for pedestrians and drivers	56%	58%	48%	61%	51%
Pedestrians have some control	17%	18%	12%	18%	16%
The bleeper is good for blind people	6%	6%	3%	7%	5%
The bleeper is good for other people	5%	5%	4%	4%	5%
Provides a safe place to cross	4%	3%	5%	3%	5%
Other answers	7%	7%	7%	6%	8%
Don't know	11%	10%	17%	9%	13%
No good things mentioned	11%	12%	11%	10%	13%
From the pedestrian's point of view what do you think are the bad things, if any, about Pelican crossings?					
There is not enough time to cross	24%	25%	19%	19%	28%
They are confusing	14%	16%	9%	15%	14%
You have to wait for the lights	8%	9%	4%	10%	7%
People misuse them	8%	9%	7%	10%	7%
Uncertainty of the 'flashing' period	4%	5%	3%	6%	3%
Other answers	10%	10%	10%	12%	9%
Don't know	6%	5%	10%	5%	7%
No bad things mentioned	40%	38%	48%	41%	39%
Base (people who had seen or used a Pelican crossing)*	*5443*	*4310*	*1133*	*2658*	*2785*

* *Some people who should have been asked these questions and the following question on preference were omitted because of a misunderstanding over the instructions for the questionnaire. We have made the assumption that the loss of these people made no difference to the overall distribution and so we present the figures for the people who were asked these questions.*

Table 9.4 Proportion of people mentioning main advantage and disadvantage of the Pelican crossing

	Proportion mentioning:			
	'priorities well defined'		'not enough time to cross'	
Driving licence				
Holds current licence	60%	*2815*	20%	*2815*
Does not	51%	*2603*	28%	*2603*
Use of crossing				
Seen, not used, Pelican crossing	39%	*855*	5%	*855*
Used Pelican crossing	59%	*4558*	27%	*4558*

Table 9.5 Use of Zebra crossing by age and sex

Tendency to use Zebra crossings	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	%	%	%	%	%
Goes out of way to use	52	49	60	45	58
Uses if convenient	16	18	9	18	14
Uses if a lot of traffic	9	9	6	12	6
Tends not to use	17	20	11	20	15
Other	4	3	7	3	4
Cannot go out on foot	2	1	7	2	3
	100	100	100	100	100
Base	*7120*	*5188*	*1932*	*3339*	*3781*

As we expected, the proportions of people mentioning the main advantage and disadvantage varied with respect to both the ability to drive and whether the person had actually used a Pelican crossing or just seen one.

More people who held a current driving licence mentioned the advantage of the well defined rights of way (60% compared with 51% of people who did not hold a driving licence) while the disadvantage of there not being enough time to cross was mentioned by fewer drivers than non-drivers. In terms of whether people had used a Pelican crossing or only seen one, 59% of the people who had used a Pelican crossing commented on the well defined priorities compared with 39% of those who had only seen one. The difference between these two groups of people was most clearly marked for the main disadvantage. Of the people who had used the crossings 27% mentioned the inadequate length of time allowed to cross whereas only 5% of the people who had seen the crossings commented on this. Further examination of these variations with age and sex revealed no differences or similarities of importance.

Thus when considering the advantages and disadvantages of Pelican crossings people mentioned more advantages than disadvantages and over three times as many said there were no disadvantages as said there were no advantages.

9.4 Zebra crossings

As Zebra crossings have been in use for so much longer than Pelican crossings it was assumed that the people interviewed would all know what they are and would most likely have used them at some time. For these reasons the question on the use of Zebra crossings referred to the tendency of the informant to use them and asked if he went out of his way to use them or not. The replies and the frequency with which they were given are shown in Table 9.5.

Over a half of the people interviewed said they went out of their way to use Zebra crossings compared to 17% who said they tended not to use them. A greater proportion of old people than of younger adults said that they went out of their way to use a crossing as did a greater proportion of women than of men.

The informants were asked what they thought were the good and bad things about Zebra crossings using the same wording as we had used for the Pelican crossings. We found that people had difficulty in answering the question about the good points, in that they tended to make vague generalisations about Zebra crossings being safe. The question on the disadvantages was answered in a slightly less vague manner, although people still made a large number of different comments, none being mentioned by more than 12% of the people asked. In Table 9.6 we show the five most frequently mentioned disadvantages of the Zebra crossing.

Table 9.6 Some disadvantages of Zebra crossings

From the pedestrian's point of view what do you think are the bad things, if any, about Zebra crossings?	All persons
Traffic doesn't give way to waiting pedestrians	12%
Pedestrians act badly at crossings	10%
Drivers act badly at crossings	8%
Crossings are dangerously sited	9%
Crossings are not conspicuous enough	7%
No bad things mentioned	44%
Base (people who can go out on foot)	*6944*

There was very little difference in the proportions of people mentioning any of the five main disadvantages. It is interesting to note that the first three disadvantages listed in Table 9.6 were all connected with the users of the crossings rather than the crossings themselves, and only two of the main disadvantages (that Zebra crossings were dangerously sited and they were not conspicuous enough) are actually concerned with the physical aspects of the crossing. This point, together with the vague answers about the advantages of Zebra crossings suggests that people did not have as many opinions about them as they had about Pelican crossings. This could either be because the Zebra crossing had, for a long time, been an established part of the highway whereas at the time of the survey the Pelican crossing was still comparatively new.

9.5 Comparisons between Pelican and Zebra crossings

From what people said about Pelican crossings it seemed that this newer type of crossing had gained a not unfavourable reception. We now go on to see how it compared with the Zebra crossing. Table 9.7 shows the results of the question 'Comparing Zebra and Pelican crossings which do you prefer, as a pedestrian?'.

Table 9.7 Comparison of Zebra and Pelican crossings

Preference	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	%	%	%	%	%
Prefers Zebra	31	30	32	27	34
Prefers Pelican	55	57	48	60	51
No preference	14	13	20	13	15
	100	100	100	100	100
**Base (people who have seen or used a Pelican crossing)*	*5443*	*4310*	*1133*	*2658*	*2785*

** See footnote to Table 9.3*

the proportions preferring Pelican crossings and of those preferring Zebra crossings (37% and 41% respectively).

Among the people who preferred Pelican crossings there was one reason for the preference which stood out above all others: the fact that the pedestrian's right of way and the motorist's right of way are both clearly defined. This reason was given by 91% of the people who preferred Pelican crossings, while no other reason was mentioned by more than 3% of this group. Among those who preferred Zebra crossings there was somewhat more diversity in the reasons for their preference. The most frequently mentioned reason being that they are more straightforward to use, 39% of people who preferred Zebra crossings mentioned this while 21% said they are better because they give the pedestrian more time to cross and 17% preferred Zebra crossings because there is no waiting for lights to change.

Looking first at the preference overall we found that 55% of people who had seen or used Pelican crossings preferred them to Zebra crossings while 31% preferred Zebra crossings. For both age groups and both sexes a greater proportion of people preferred Pelican crossings to Zebra crossings than vice versa. More people aged less than sixty than those aged sixty and over preferred Pelican crossings (57% compared to 48%) and more men preferred Pelican crossings than women did (60% of men compared with 51% of women).

The most frequently mentioned advantage and the most frequently mentioned disadvantage were more often commented on by people who used Pelican crossings than by those who have only seen them. This being the case it is of interest to see whether the advantages or disadvantages were of more importance to the users when they compared Pelican crossings to Zebra crossings.

Table 9.8 shows that in the view of 59% of people who had used a Pelican crossing the advantages outweighed the disadvantages so they preferred them to Zebra crossings. A preference for Zebra crossings was expressed by only 29% of people who had actually used a Pelican crossing. Among people who had seen a Pelican crossing but had no personal experience of using one, however, there was no statistically significant difference between

Table 9.8 Comparison of Zebra and Pelican crossings by whether informants had seen or used Pelican crossings

Preference	Seen not used Pelican crossing	Used Pelican crossing
	%	%
Prefers Zebra	41	29
Prefers Pelican	37	59
No preference	22	12
	100	100
Base (people who have seen or used a Pelican crossing)	*855*	*4558*

It is interesting to note that the three most frequently mentioned reasons for preferring Zebra crossings to Pelican crossings were the negative forms of the three most frequently mentioned disadvantages of Pelican crossings, while the most frequently mentioned reason for preferring the Pelican crossing was, as one would expect, the same as its most frequently mentioned advantage. Thus it would appear that people's preference for Pelican or Zebra crossings was mostly influenced by their like or dislike of the Pelican crossing rather than any particular feeling about the Zebra crossing. This explains to some extent the reduction in the proportion who preferred Pelican crossings found among those people who had seen but not used them. It seems plausible that people who had only seen the crossings would not have as many views on them or know as much about them as those who had actually used them and in this situation the proportion who preferred Zebra crossings (about which they knew more) would rise.

Table 9.9 Main reasons for preferring Pelican or Zebra crossings

Prefers Pelican crossing	All persons
Priority for pedestrians and motorists well defined	91%
Base (people who prefer Pelican crossings)	*3011*
Prefers Zebra crossing	
Straightforward to use	39%
More time to cross	21%
No waiting for lights	17%
Pedestrian priority all the time	14%
Base (people who prefer Zebra crossings)	*1684*

9.6 Pelican crossing signals

We have found that the main reason given for preferring the Pelican crossing to the Zebra crossing was that the signals of the Pelican make clear to both the pedestrian and the motorist who has right of way, while the main reason for preferring the Zebra to the Pelican crossing was that Zebra crossings were more straightforward to use which implies that Pelican crossings are complicated. Both these reasons relate to people's understanding of the meaning of the different signals, with the former depending for its validity on people correctly understanding the signals and the latter showing that some people felt they did not understand them, so it is particularly important to find out what, in fact, people thought the signals meant.

We asked a series of questions about the meaning of the three different signals that occur at a Pelican crossing, recording the spontaneous replies given. It must be borne in mind when considering these results that this survey was conducted in 1975 and, since that time, there have been several campaigns designed to publicise the Pelican crossing and educate the general public in its use. In addition, more crossings have been installed and a longer time has elapsed for more people to become familiar with them. Consequently, if further research were carried out now, answers given to the meaning of the different Pelican signals would probably present a somewhat different picture from the one found in 1975.

It was not particularly surprising to find that a very high proportion of people (96%) thought that the 'red man' meant 'do not cross' which is the correct interpretation. There were 2% who said they did not know that it meant, 1% who thought that the 'red man' meant it was safe to cross and just less than 1% who gave other meanings. It seems probable that these groups of people, if confronted with a Pelican crossing, would correctly understand the 'red man' signal but that in the interview were unable to give the correct meaning, and so, effectively, everyone knew what the signal of the 'red man' meant.

Table 9.10 shows what people understood by the steady signal of the 'green man' at the Pelican crossing. Without looking at the figures it is immediately obvious from the range of answers that the 'green man' signal was not quite as well understood as the 'red man'. Of the people who had seen or used Pelican crossings 89% thought the signal meant that the pedestrian had right of way and that it was safe to cross, with only 2% adding the rider that the road must be clear. The correct interpretation includes checking for traffic and although only 2% of the people actually said this it must be assumed that some, at least, of the 89% who did not state this do in fact check for traffic before they cross. Slightly more younger adults than elderly thought that the 'green man' signified the pedestrian's right of way and slightly more men that women thought this. There were 5% of the people who thought that the steady 'green man' meant that the pedestrian had to get ready to cross which presumably meant waiting for the 'flashing green man' in order to cross which could lead to dangerous situations for the pedestrian. This proportion showed no variation with age or sex. As with the 'red man' signal 1% of the people inverted the meaning of the 'green man' signal completely to 'do not cross'.

We now turn to look at the innovatory signal of the Pelican: the flashing 'green man'. It is apparent from

Table 9.10 What does the 'green man' mean?

Meaning given by informant	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	%	%	%	%	%
Pedestrian's right of way; safe to cross	89	89	85	91	86
Cross if the road is clear	2	2	0	2	2
Get ready to cross	5	5	5	4	6
Do not cross	1	1	2	1	1
Other	1	1	2	1	1
Don't know	2	2	6	1	4
	100	100	100	100	100
Base (people who have seen or used a Pelican crossing)	*5667*	*4480*	*1187*	*2800*	*2867*

Table 9.11 What does the flashing 'green man' mean?

Meaning given by informant	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	%	%	%	%	%
Don't start to cross but if started keep going	7	8	4	9	5
Don't start to cross; don't cross	14	13	15	13	14
If started keep going	2	2	1	4	1
Hurry up; lights about to change	18	19	14	19	16
Don't start to cross but if started hurry	2	2	1	3	1
Cross with caution	20	22	15	23	18
Safe to cross	12	12	11	10	13
Other	9	10	9	8	11
Don't know	16	12	30	11	21
	100	100	100	100	100
Base (people who have seen or used a Pelican crossing)	*5667*	*4480*	*1187*	*2800*	*2867*

Table 9.11 that the signal was not particularly well understood. A large number of different answers were given and no one answer was given by more than 20% of the people. Although we have included all meaning given by 2% or more of the people who were asked this question we still found 9% of the people gave answers which were impossible to classify.

The flashing signal indicates that the pedestrian has right of way if he is on the crossing but he should not start to cross the road. Only 7% of the people who had seen or used Pelican crossings actually said this. There was a slight variation in this proportion with age and sex with more young adults giving the correct answer and more men doing so. There were 14% who thought that the flashing signal meant 'do not start to cross the road' without mentioning the pedestrian's right of way if already on the crossing and a further 2% who did mention this but did not say anything about not starting to cross. The meaning most often given for the flashing signal was 'cross with caution', an answer given by 20% of the people who had seen or used Pelican crossings. More younger people than older people said this (22% as compared to 15%) as did more men than women (23% as compared to 18%). There were 18% of the people who thought that the flashing light indicated that the lights were about to change so the pedestrian had to 'hurry up'. Again fewer women than men thought this and fewer elderly people than the younger adults said this.

As we have said there were 9% of the people who gave answers which did not form any definite groups. These answers fell into four very approximate divisions. There were those which implied without actually stating that the flashing signal indicates that the lights are about to change to give either the pedestrian or motorist right of way; those which were answered from the driver's point of view (ie they were probably giving the meaning of the flashing amber light); those which gave so many different or contradictory meanings that they implied the informant did not know what the signal meant and finally those which did not fit into any category at all such as 'you take your chance, it's quite possible to be run down if you are on the crossing'.

The variation which occurred with age and between the two sexes was partly due to the fact that many more older people than younger people said they did not know what the signal meant (30% as compared to 12%) and many more women than men said this (21% as compared to 11%). These proportions gave an overall figure of 16% who said they did not know what the flashing signal indicated.

Whereas both the 'red man' and the 'green man' signals seemed to have been fairly well understood the flashing signal obviously had not. For this reason we now go on to see how the usage of the Pelican crossing affected people's understanding of the flashing signal and Table 9.12 shows what people said the flashing 'green man' meant by whether they had only seen or actually used a Pelican crossing.

Table 9.12 Meanings of flashing 'green man' by whether informant had seen or used Pelican crossings

Meaning given by informant	Seen but not used	Used
	%	%
Don't start to cross but if started keep going	3	8
Don't start to cross; don't cross	11	14
If started keep going	1	3
Hurry up; lights about to change	14	19
Don't start to cross but if started hurry	1	2
Cross with caution	21	20
Safe to cross	14	11
Other	10	9
Don't know	25	14
	100	100
Base (people who have seen or used a Pelican crossing)	*1065*	*4602*

As might be expected more people who had used Pelican crossings gave the correct meaning of the flashing 'green man' than those who had only seen the crossings and more of those who had only seen Pelican crossings said they did not know what the signal meant. Slightly more people who had used the crossings thought the signal meant that the pedestrian had to hurry up as the lights were about to change than those who had only seen them (19% as compared to 14%) but there was no difference in the proportions who thought the signal meant 'cross with caution'.

It would thus appear that the very few people who correctly understood the meaning of the flashing 'green man' form a fairly heterogeneous group, which contains more men than women, more young people than old people, and more people who had used Pelican crossings than those who have only seen them, but is by no means restricted to people with these characteristics only.

The main advantage and reason given for preference of the Pelican crossing was that the pedestrians' and motorists' rights of way were clearly defined, which is, in fact, the case. However, the last section has shown that the lack of understanding about the flashing signal must throw some doubt on the clarity of whose is the right of way during the sequence of the flashing 'green man'. There is clearly a need for considerable education about this signal if the Pelican crossing is to reach its full potential, although, as we stated at the beginning of the section, since 1975 there have been several campaigns which may have led to a fuller understanding of the signals among the general public.

9.7 Summary

At the time of the survey, two thirds of the informants said they had used a Pelican crossing. When considering its advantages and disadvantages more people mentioned advantages than disadvantages and the most frequently mentioned advantage was that the pedestrian and the motorist have well defined rights of way. Among those interviewed, the Pelican crossing compared favourably with the Zebra crossing. Of the two crossings, 55% of people preferred the Pelican crossing, mainly for the reason most frequently given as its advantage. However, this advantage of the Pelican crossing is somewhat diminished, since a large majority of people did not understand the flashing signal. Practically every one correctly defined the 'red man' signal and the 'green man' signal, but only 7% correctly defined the flashing 'green man' signal, but only 7% correctly defined the flashing 'green man' signal. Although some of the definitions given would not necessarily have resulted in a harmful situation they must detract from the Pelican crossing being used to its full potential.

PART III

Pedestrian accident risk

10 Pedestrian activity and casualty rates

10.1 Pedestrian casualties and the casualty rates per head of population

In the first part of this report we have looked in some detail at the overall pedestrian exposure measures and their variation with respect to certain personal and journey characteristics. This has provided a background of information against which we can now look at the relationship of pedestrian exposure and accident rates. One of the central hypotheses around which this study was designed was that the variation seen in the accident rates with age and sex might be due in part to the variation in the amount of pedestrian activity experienced by different people.

Previously it has been possible to present pedestrian accident statistics only as straightforward totals or as rates per 100,000 people in the population but with the information collected in this survey it was possible to calculate pedestrian casualty rates per unit of pedestrian activity. Thus as the accident rates of vehicle occupants injured in road accidents can be presented as casualties per hundred million vehicle kilometres travelled so we can calculate the pedestrian casualty rate per hundred million kilometres walked. The accident statistics are usually produced for a whole year, but for the reasons already stated (Section 1.5) we collected the information about pedestrian exposure for the months of September and October only. The number of pedestrian accidents varies according to the time of year so in order to examine the relationship of exposure and accidents we needed the accident statistics for the same time of year as the fieldwork. The Transport and Road Research Laboratory processed the accident figures accordingly so that we had figures corresponding to the fieldwork period.

The exposure information was related to one particular day for each person interviewed so although the fieldwork period was two months long the survey provided exposure measures which were averages for one day. We therefore calculated the average number of accidents per day to produce values compatible with the exposure measures. Thus where a time period is needed, the rates in terms of pedestrian exposure used in this part of the report will be rates per average day in September and October. Although this is the case we will see when we come to Figure 10.2 that the relationships between age and sex were very similar to those seen for the whole year in Figure 1.1.

Before we go on to look at how the accident rates varied according to which exposure measure was used we will look first at the overall distribution of accidents among men and women by ten year age groups.

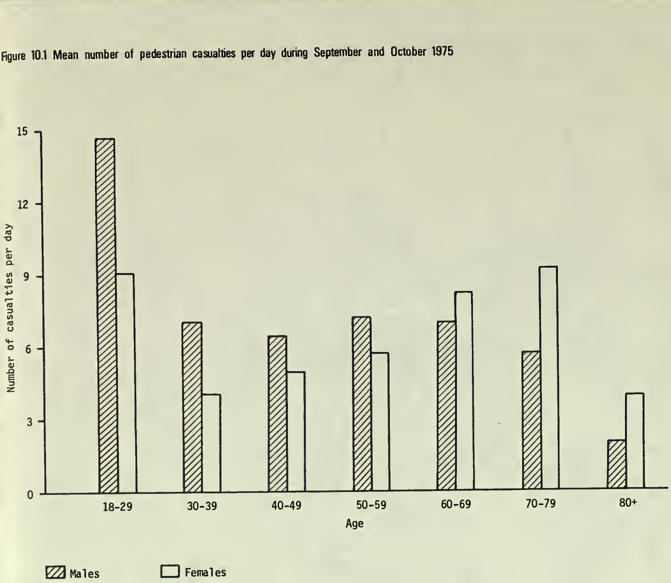
Figure 10.1 shows that the highest average number of pedestrian casualties per day was among men in the eighteen to twenty-nine year old age group and the lowest among men aged eighty and over. Women aged less than sixty had fewer accidents than men while women aged sixty and over had more accidents than men. However these relationships changed dramatically when the number of people in the population was taken into account (Figure 10.2). This Figure shows the average number of pedestrian casualties per day per hundred thousand people in the population. As we said earlier the relationships were very similar to those for the figures taken over a year having taken into account the effect of the numerator being reduced by a factor of approximately 365. The casualty rate increased with age for both men and women with the exception of the eighteen to twenty-nine year olds, who had a casualty rate higher than that of the sixty year olds for the men and higher than that of the fifty year olds for the women. The only other exception occurred among the women aged eighty and over, whose casualty rate was no higher than their counterparts in the preceding age group. Men had a higher casualty rate than women among the younger age groups (those aged less than sixty), and this was also true for the very old. However among the sixty and seventy year olds there was no difference in the casualty rates of the two sexes.

10.2 Pedestrian casualty rates based on exposure measures

We have seen that by looking at the population casualty rates rather than the total numbers of casualties the relationships between the different age groups and sexes changed, so we now go on to see if the inclusion of some measure of exposure made any more difference. There were, of course, many different measures we could use and we begin by looking at the most basic: the proportion of people who could go out of the house on foot. In Figure 10.3 the denominator of the casualty rate changes from people in the population to people in the population who could go out on foot. As might be expected the variations among the younger adults were very similar to those in Figure 10.2 but there were changes for the elderly. Both men and women aged seventy and over had higher casualty rates when the number who could go out on foot was taken into consideration. The women in their seventies had a higher casualty rate than the men, and the women aged eighty and over had a higher casualty rate per hundred thousand people who could go out on foot than the women in their seventies.

In the chapter on the variation in the overall exposure measures we saw not only how the proportion of people who could go out on foot varied, but also the differences

Figure 10.1 Mean number of pedestrian casualties per day during September and October 1975



which occurred between the different age groups and the two sexes in the proportion of people who did some walking on an average day. We found for example that 22% of men did no walking at all on an average day, while this was true for only 10% of women. So we now look in Figure 10.4 at the pedestrian casualty rate based on the estimated number of people out walking on an average day.

It was immediately apparent that, for the elderly, casualty rates based on the proportion of people who went out on foot were substantially higher than those shown in the previous Figures, thus refuting, for the elderly at least, the hypothesis of a direct relationship between exposure and accidents. Among the men, however, the increase in this casualty rate with age was only true for those aged 70 and over, there being no difference between the casualty rates of men in their 50s and 60s. There was a large increase in the casualty rate of women aged 80 and over when the proportion of people who did some walking was taken into account, due to the fact that a very large proportion (66%) did not do any walking on their sample day.

Consideration of the numbers of people who went out on an average day led to there being larger differences between these casualty rates for men and women than between those presented in the previous Figures, with men being at more risk and women at less risk of becoming a pedestrian casualty.

We have been looking so far at the basic measure of pedestrian activity, ie whether people went out on foot or not, and we have not yet used the more detailed measures which took into account how much people walked when they did go out. As we have already seen this activity can be expressed in terms of the distance walked, the time spent walking, the number of roads crossed, the number of times the pedestrian stepped from a place of relative safety into the road (safe points) and the number of paces taken by the interviewer to cross the roads.

Figure 10.5 shows that adding the detail of the amount of walking done by those who do some to the denominator of the casualty rate measure did not radically alter the shape of the distribution. The difference in these new rates between the older and younger adults became greater but the differences between them for the two sexes remained much the same except for the very old among whom women had a greater casualty rate per hundred million kilometres walked than men did. One other change due to the inclusion of the average exposure measures was the decrease in the casualty rate for the men aged eighteen to twenty-nine. In terms of casualties per hundred million kilometres walked it was about the same as that for the men in their thirties and forties (about 124). This suggests that for the men aged eighteen to twenty-

Figure 10.2 Mean* number of pedestrian casualties per 100,000 population

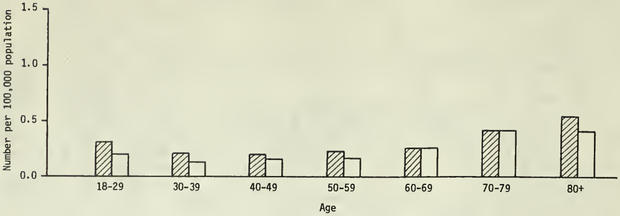


Figure 10.3 Mean number of pedestrian casualties per 100,000 people in the population who can go out on foot

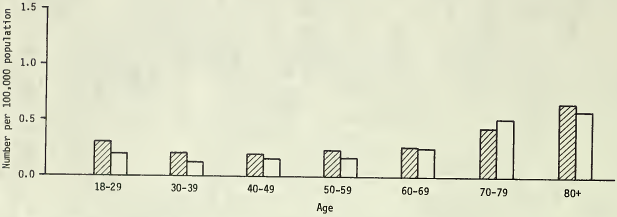
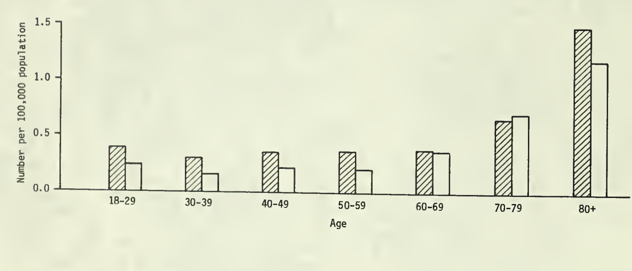


Figure 10.4 Mean number of pedestrian casualties per 100,000 people in the population who do some walking on an average day



*In this and all consecutive figures the values are based on an average for one day

Figure 10.5 Mean number of pedestrian casualties per hundred million kilometres walked

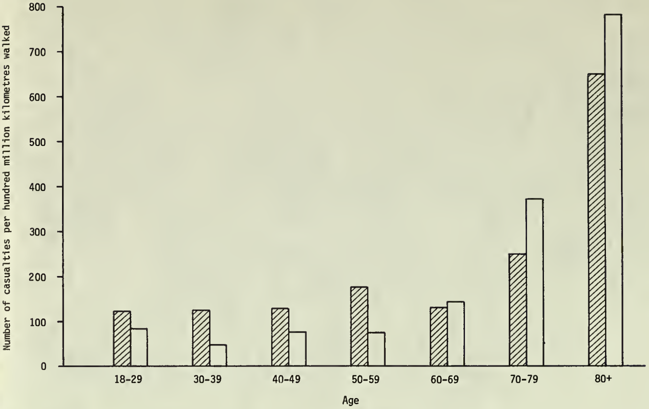


Figure 10.6 Mean number of pedestrian casualties per hundred million hours spent walking

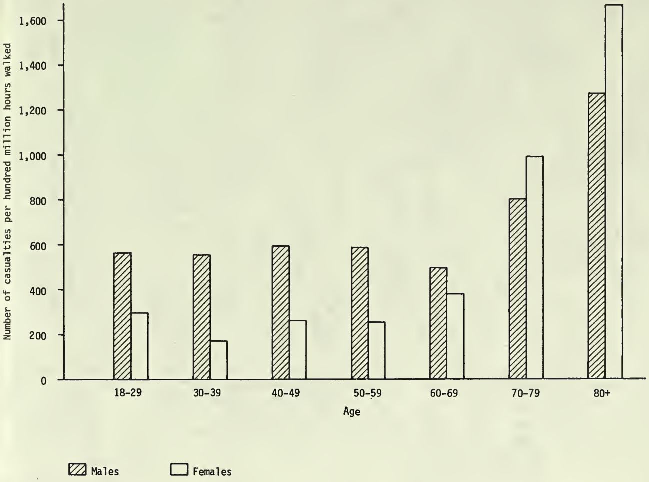


Figure 10.7a Mean number of pedestrian casualties per hundred million roads crossed

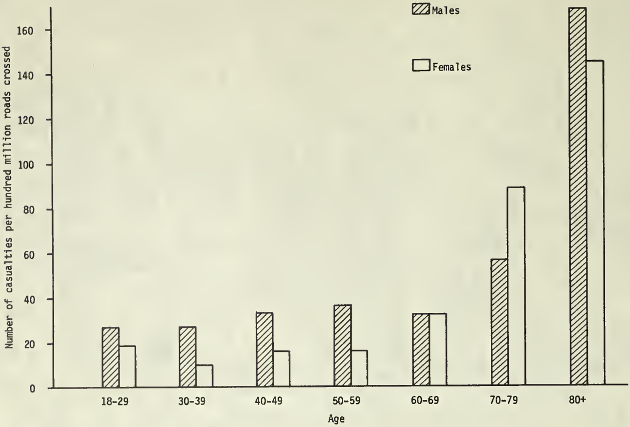


Figure 10.7b Mean number of pedestrian casualties per hundred million road sections crossed (safe points)

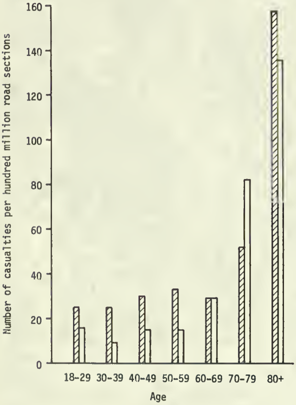
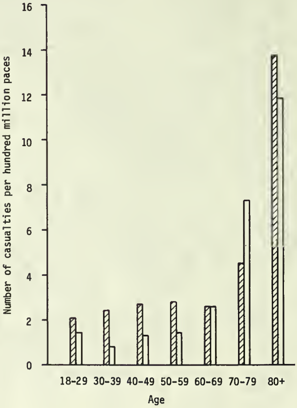


Figure 10.7c Mean number of pedestrian casualties per hundred million interviewer road crossing paces



nine there might exist a direct relationship between pedestrian exposure and pedestrian accidents.

The pedestrian casualty rates per hundred million hours spent walking are shown in Figure 10.6. In this Figure the shape of the distribution does show some variation from the other Figures seen so far, mainly in the relationship between the sexes. The difference between these casualty rates for men and women aged less than sixty appears to be very large while the difference between the rates for the younger men and those for the older men was not as large as it has been in previous Figures. However, as we stated in Section 6.1, there is a probability that the estimate of the time spent walking has been adversely affected by shopping journeys in that time spent in the shops during these journeys is often very difficult to exclude which leads to an overestimate of the time spent walking. This in turn would lead to an underestimate of the pedestrian casualty rate per hundred million hours spent walking and since women have a higher pedestrian exposure (using distance walked as a measure) for shopping purposes than men do this will affect the estimate of these casualty rates of the women more than it will affect those of the men. Thus the large difference seen between these casualty rates for men and women aged less than sixty could be in part due to this.

We now turn to the third measure of pedestrian activity: the number of roads crossed and its two associated measures: the number of times the pedestrian stepped from a place of relative safety into the road (safe points), and the number of paces taken by the interviewer to cross the road when she retraced the walking routes. Figure 10.7 shows the pedestrian casualty rates calculated using each of these three measures.

It is clear from this Figure that the use of 'safe points' and the number of paces taken by the interviewer in crossing the road adds very little, if any, information to that provided by the number of roads crossed. In fact the distribution by age and sex due to using the number of roads crossed as the denominator in the rate calculation was very similar to that produced using distance as the exposure measure (Figure 10.5), with the exception of the eighty year olds and over among whom the women had a lower casualty rate per hundred million roads crossed than men did, whereas the opposite was true for the rate per unit distance. Once again the elderly had very high casualty rates compared to the young, and the men aged less than sixty had a higher casualty rate than the women in that age group. The high rate per hundred thousand people in the population seen for the eighteen to twenty-nine year old males was considerably reduced as it also was when using distance as the exposure measure.

10.3 Summary

When the yearly accident statistics are produced the pedestrian casualty rate per head of population is calculated and it is found that people aged sixty or more have a much higher casualty rate than the younger adults, and men have a higher casualty rate than women. Using the exposure information a measure of pedestrian risk defined as the number of casualties per measure of exposure can be calculated. However the introduction of this measure of pedestrian activity did not serve to reduce the differences between the casualty rates of the elderly and the younger adults, but rather to increase them and, when using measures which take into account the actual amount of walking done, increase them dramatically. The differences between these new rates for men and women were also slightly larger than those based on population figures alone. The only group for whom the introduction of pedestrian activity into the calculation of casualty rates produced a lowering of the rate compared to the other age groups was the eighteen to twenty-nine year old men. This suggested that the high number of pedestrian casualties experienced by this group could be related to the large amount of walking they do.

11 Pedestrian activity and the corresponding casualty rates on different days and at different times

11.1 The variation in pedestrian casualty rates with respect to the day of the week
In the previous chapter the effect of using different measures of exposure as denominators for the pedestrian casualty rates was discussed. Apart from the division into groups by age and sex, the casualty figures were used in an aggregated form, that is in each calculation of casualty rate the numerator was taken as the average number of pedestrian casualties per day in the September and October of 1975. There is, in fact, considerable additional information available about pedestrian accidents such as the day of the week and time of day when the accident occurred and the nature of the road situation at the scene of the accident. The survey had been designed to produce similar data for the pedestrian activity measures, thus enabling more detailed analyses to investigate the relationship between exposure and pedestrian accidents in specified situations.

As we explained previously, the sample was designed to produce not only a representative selection of people but also of pedestrian activity by day of the week. It was known that the number of pedestrian casualties varied with respect to day of the week, so with the survey data it was possible to ascertain whether the casualty rates also varied in this way. There was one other aspect which also has a bearing on pedestrian casualty rates and which was also known to vary with respect to day of the week (and indeed other variables): the numbers of vehicles on the roads or 'vehicle flow'. The methodology of this study, designed to measure pedestrian activity, precluded any direct measure of vehicle flow, so although there is no estimate of its effect in any of our calculations, its general effect needs to be borne in mind throughout the next two chapters.

Table 11.1 shows the average number of pedestrian casualties per day during the fieldwork period and the pedestrian casualty rate based on the number of roads crossed and the distance walked. We have omitted the rate per unit time spent walking for the reasons given in Section 6.1.

The overall mean number of pedestrian casualties varied considerably with respect to the day of the week with Sunday being the day when the fewest accidents happened and Friday the day when the most happened. This distribution however is very similar to that seen previously in Table 5.1 where the basic exposure measures were presented. The second two columns of Table 11.1 show the result of allowing for the differing amounts of pedestrian exposure on different days of the week. Looking first at the casualty rate per hundred million roads crossed we can see that the risk of being a pedestrian casualty on Sunday was, in fact, just as high as for an average Monday to Thursday or a Saturday and that the low figure for the total number of casualties could be explained by the low pedestrian exposure on that day.

However, in terms of the number of casualties per hundred million kilometres walked, Sunday was a day of lower risk than the other days of the week but the difference was not as large as that seen between the numbers of casualties. For both sets of casualty rates, Friday was a

Table 11.1 Pedestrian casualties and the pedestrian casualty rates by day of the week

Day of the week	Mean number of casualties per day	Pedestrian casualties per 100 million:	
		roads crossed	kilometres walked
Mon-Thur	93.6	26	123
Friday	132.1	32	147
Saturday	110.9	27	122
Sunday	48.4	26	101
All days	95.1	27	125

Table 11.2 Pedestrian casualty rates by day of the week, age and sex

Day of the week	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	Pedestrian casualties per 100 million roads crossed				
Mon-Thur	26	20	52	31	22
Friday	32	26	50	41	25
Saturday	27	21	53	32	22
Sunday	26	23	31	28	21
All days	27	21	50	33	23
	Pedestrian casualties per 100 million kilometres walked				
Mon-Thur	123	93	236	147	107
Friday	147	121	228	180	121
Saturday	122	98	218	148	99
Sunday	101	96	111	103	97
All days	125	100	215	147	107

day of high risk so it was not exposure alone which accounted for the high number of casualties on this day of the week.

We now look at how the casualty rates varied with age and sex. In the previous chapter we gave figures for age grouped into ten year bands but for the purpose of looking at the variation with respect to day of the week, we have used the two age groups presented in part 1 of this report: people aged 18 to 59 and those aged 60 and over.

Separating the casualty rates for the two age groups showed that while, for the elderly, Sunday stood out as a day of low risk compared to the rest of the week, it was Friday that stood out among the younger adults as a day of comparatively high risk. Friday also stood out as a day of high risk for the men in terms of the casualty rates based on both exposure measures but for this group the casualty rate per hundred million kilometres walked was also lower for Sunday. Among the women there was no difference between any of the days in the casualty rates per hundred million roads crossed while Friday was a day of high risk as measured by the rate per hundred million kilometres walked.

The differences in casualty rates between the older and younger adults are much as one would expect from the overall figures for most of the days with one exception. On Sundays the rate per hundred million roads crossed for the elderly was just under one and a half times that for adults aged less than sixty, while for the rest of the week it was about two and a half times as great. Calculating the casualty rate using the distance walked as the denominator results in very little difference between the rates for the younger adults and the elderly for Sunday, while for the other days of the week the rates for the elderly were over twice the values of those for the younger adults.

The variation found in the pedestrian casualty rate figures between Sunday and the rest of the week suggests that exposure could play a more important part in determining the variation in the casualty rates for people of different ages on Sundays than it does on other days. This could be due to a variety of reasons, one of the more obvious being that there are fewer vehicles on the roads on Sundays.

We have shown that pedestrian casualty rates vary with respect to day of the week. If the risk of being a pedestrian casualty varied throughout the day then the differences in the rates for each day of the week could be due in part to a variation in the patterns of pedestrian exposure through the day with respect to day of the week. In order to test this hypothesis we need to look at two factors. First, whether the casualty rates vary for different times of day and second, whether exposure patterns, in terms of the times of day when people walk, vary with the day of the week. We shall consider the first by dividing the day into the hours of daylight and darkness and then into more detailed time periods and then go on to the second by looking at the variation in the casualty rates by time of day and day of the week.

11.2 The variation in pedestrian casualty rates for daylight and darkness

For the purposes of the accident statistics, the hours of darkness are defined as lasting from half an hour after sunset to half an hour before sunrise thus coinciding with 'lighting up time'. In order that the exposure data would correspond exactly to the accident data this precise definition was also used in the survey (see Appendix E).

Table 11.3 shows the number of pedestrian casualties for daylight and darkness and the casualty rates using the number of roads crossed and the distance walked in the daylight and darkness as the denominators. It must be remembered that these figures were for the months of September and October ie during British Summer Time. Thus the evening rush hour peak of accidents was happening in the daylight.

Over twice as many pedestrian casualties occurred during the daylight as in darkness but when the amount of pedestrian activity which took place during these two periods of the day was taken into account we can see that the pedestrian was, in fact, at almost three times as much risk of being a pedestrian casualty in the darkness as he was in the light, according to both the distance walked and the number of roads crossed. Table 11.4 shows how

Table 11.3 Pedestrian casualties and the pedestrian casualty rates for daylight and darkness

Light	Mean number of casualties per day	Pedestrian casualties per 100 million:	
		roads crossed	kilometres walked
Daylight	65.1	22	99
Darkness	29.9	61	292
Total	95.1	27	125

Table 11.4 Pedestrian casualty rates per 100 million roads crossed for daylight and darkness by age and sex

Light	Pedestrian casualties per 100 million roads crossed				
	All persons	Age		Sex	
		18-59	60 and over	Male	Female
Daylight	22	16	43	24	20
Darkness	61	53	111	70	48
Total	27	21	50	33	23

the rates per hundred million roads crossed varied with age and sex.

The relationships between the rates for daylight and darkness for the two age groups and both sexes were very similar to those seen overall. The elderly were at more risk than the younger adults of becoming a pedestrian casualty whatever lighting conditions prevailed although both groups were more at risk in the dark with the elderly having a casualty rate of over a hundred per hundred million roads crossed in the dark. Although men still had a higher casualty rate in the dark than women did, the difference between the two casualty rates in the daylight (24 and 20) was not found to be statistically significant. Thus the overall difference seen in rates between men and women resulted mainly from the differences in the casualty rates for the hours of darkness.

11.3 The variation in pedestrian casualty rates at certain times of day

Having seen how the casualty rates varied when the day was divided into the hours of daylight and darkness we now go on to look at the variation which occurred with respect to time of day specified in greater detail.

The survey data were collected to allow the pedestrian activity information to be presented for time periods of two hours duration beginning at midnight of the day previous to the sample day. Walking periods which overlapped the two hour periods thus specified were divided and the relevant data were assigned to each of the new time periods. As the information relating to the time of day was an estimate given by the informant many of the walking periods ended or began on the hour. In cases where this would have meant the introduction of a new two hour period for one minute of a journey this time was included in the time period covering the major part of the journey. Thus in Table 11.5 the time periods are labelled as overlapping on the minute around the hour.

For some time periods, particularly the first few, the numbers of pedestrian casualties and the pedestrian exposure experienced by the population are both so small that meaningful casualty rates cannot be calculated from a study of this size. For this reason we have chosen to present the casualty rate figures for six of the two-hour periods only. These cover the whole morning, the late afternoon and early evening and the late evening and night, thereby presenting exposure measures for the two rush hour periods, morning shopping time, lunch time and the period when people are likely to be returning from an evening's entertainment. In this section we have used the number of roads crossed as the exposure measure. The time periods used account for 72% of the casualties and 70% of the roads crossed during an average day. Table 11.5 shows the average number of casualties that occurred in the specified time periods and the corresponding casualty rates per hundred million roads crossed.

Looking first at the mean number of adult pedestrian casualties we can see that overall the most casualties occurred between four and six pm and late at night. Most of the adults who were injured in pedestrian accidents between ten and twelve o'clock at night were aged less than sixty and were men, while the casualties in the evening rush hour were more evenly divided between the two age groups and the two sexes.

The casualty rate for pedestrians out late at night was very high. People out walking between ten and twelve o'clock at night were at four times the risk of becoming a pedestrian casualty as those out walking between eight in the morning and two in the afternoon. The elderly had a higher casualty rate than adults aged less than sixty for every time period shown here, with the rate for the elderly between ten and twelve pm being as high as 119 casualties per hundred million roads crossed. The overall difference of men being more at risk of becoming pedestrian casualties than women was seen only for the last time period (10pm to midnight) when there were 104 male pedestrians casualties per hundred million roads crossed compared to 61 female casualties. None of the other differences seen in this table between men and women was statistically significant, which might be expected for the time periods 8am to 10am through to 4pm to 6pm since we have already shown that there was no difference between the daylight casualty rates of men and women.

Thus we have seen that the pedestrian casualty rates varied by time of day. We now go on to see whether this variation was related to the variation seen with respect to day of the week, by looking at the variation in the casualty

Table 11.5 Pedestrian casualties and the pedestrian casualty rates by time of day, age and sex

Time of day	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	Mean number of pedestrian casualties per day				
8.00 — 10.00	9.0	5.5	3.5	3.8	5.2
10.00 — 12.00	11.2	4.6	6.6	4.7	6.5
12.00 — 14.00	12.0	6.7	5.3	5.2	6.8
16.00 — 18.00	14.2	8.5	5.6	6.6	7.6
20.00 — 22.00	8.1	5.1	2.9	4.8	3.2
22.00 — 24.00	13.8	11.3	2.6	10.5	3.3
	Pedestrian casualties per 100 million roads crossed				
8.00 — 10.00	21	15	50	25	19
10.00 — 12.00	18	11	32	22	15
12.00 — 14.00	20	14	44	19	21
16.00 — 18.00	31	23	70	34	29
20.00 — 22.00	41	31	94	43	37
22.00 — 24.00	90	86	119	104	61

Table 11.6 Pedestrian casualty rates per hundred million roads crossed by time of day and day of week.

Time of day	Pedestrian casualties per 100 million roads crossed			
	Mon-Thur	Friday	Saturday	Sunday
10.00 — 12.00	20	20	14	6
16.00 — 18.00	33	31	27	17
22.00 — 24.00	74	112	128	76
Whole day	26	32	27	26

rates according to time of day and day of the week. We have selected three time periods: 10am to midday, 4pm to 6pm and 10pm to midnight.

The casualty rates were not constant for each time period regardless of the day of the week. The pedestrian would appear to be at more risk of being injured in a road accident late at night on a Saturday for example than he would be late at night on an average Monday to Thursday. On an average Monday to Thursday there were 74 pedestrian casualties per hundred million roads crossed between the hours of 10pm and midnight. This figure increased dramatically to 128 for the same time on a Saturday. The daytime figures for a Saturday were slightly lower than those for an average Monday to Thursday and this resulted in whole day rates which were similar for Saturday and the average of Monday to Thursday. Friday, however, had a high casualty rate for the two daytime periods similar to an average Monday to Thursday while the casualty rate for 10pm to midnight was more like that of a Saturday thus producing an overall higher rate. One explanation of the very high casualty rates between 10pm and midnight on Fridays and Saturdays may in all probability be the effect of alcohol, not only on vehicle drivers at that time but also on pedestrians.

11.4 Summary

The smaller number of pedestrian casualties on Sundays largely corresponded to the smaller amount of pedestrian activity which took place on that day producing an overall rate per hundred million roads crossed equal to that of a Monday to Thursday or Saturday. However Friday was a day of high risk. This difference resulted from the casualty rate varying with time of day together with day of the week. The casualty rate increased throughout the day and pedestrians were at three times more risk of becoming a casualty at night than in the daylight. The elderly were always at more risk than the younger adults while the differences in the rates between men and women were seen to stem mainly from a difference in the casualty rates late at night.

12 Pedestrian activity and the corresponding casualty rates for different road situations

12.1 The variation in pedestrian casualty rates with respect to pedestrian action

Various different pedestrian casualty rates can be calculated from the numbers of casualties and the exposure measures when they have been grouped according to the time of the accident or the type of place where it occurred. In the previous chapter we looked at the rates by time of day and we now go on to look at the rates for the type of place where accidents occurred.

Most of the details collected by the police referring to the scene of a pedestrian accident are concerned with the road itself, (for example the road class) so in this study equivalent information was recorded about each road crossed. However, although the large majority of accident happen when the pedestrian is crossing the road not all do so. Thus the best correspondence between survey and accident data is obtained when only road crossing accidents are considered. This produces casualty rates such as the number of pedestrian casualties which occurred while the pedestrian was crossing an 'A' road per unit number of 'A' roads crossed.

Before we look in this detail at the casualty rates, it is of interest to look at the variation with age and sex of the numbers of pedestrians who were involved in accidents while crossing the road compared with those involved in accidents when they were not crossing the road. Table 12.1 shows the number of casualties according to pedestrian action, age and sex, and also the casualty rate per hundred thousand people in the population.

Looking first at the mean number of pedestrian casualties per day we can see that over four times as many pedestrians were involved in accidents while crossing the road as were involved in accidents when not crossing the road. Among the casualties there were more adults aged less than sixty than aged sixty and over and this was so for both types of pedestrian action. There was very little difference between the numbers of men and women in the group who were involved in an accident while crossing the road, but among the casualties who were not crossing the road there were more men than women. Part of this difference could possibly arise from the fact that more men than women have jobs which involve them being in the road but not crossing, for example when loading lorries and vans, although it must be remembered that this category also includes accidents which happen on footpaths or refuges.

We saw in Chapter 10 that the casualty rate per head of population was higher among men than among women and Table 12.1 shows that this difference is seen both for road crossing and non-road crossing accidents.

Although the elderly had a higher casualty rate than the younger adults when crossing the road there was no difference in the rates for the two age groups when not crossing the road. As this is a change from the general trends we look in more detail at these figures in Figure 12.1. This Figure shows that the overall trend with age seen originally in Figure 10.2 comes mainly from the casualties which occurred when the pedestrian was crossing the road while there was very little variation with age for the casualty rates of pedestrians who were not crossing the road. As the study of the variation in pedestrian casualty rates for people of different ages was one of the main purposes of the survey, it is particularly pertinent to examine closely the relationship between the numbers of roads crossed and the numbers of pedestrian casualties which occur when the pedestrian was actually crossing the road.

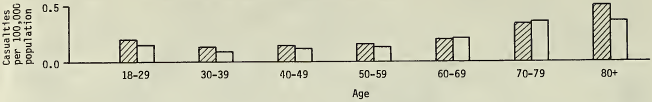
Having seen how the pedestrian road crossing casualty rate per hundred thousand people in the population varies we now introduce a measure of exposure into the rate calculation. This is where the general exposure measure of the numbers of roads crossed is used in a more specific way to be compared directly with the accidents

Table 12.1 Pedestrian casualties and the casualty rates by pedestrian action, age and sex

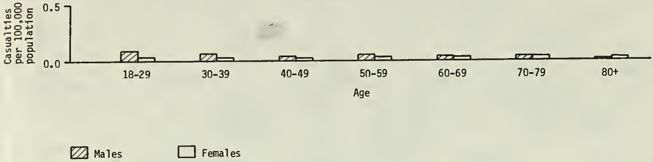
Pedestrian action	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	Mean no. of pedestrian casualties per day				
All actions	95.1	59.1	36.0	49.9	45.2
Crossing road	70.8	41.0	29.8	35.0	35.8
Not crossing road	15.7	12.1	3.6	10.0	5.7
Action not known	8.6	6.1	2.5	4.9	3.7
	Pedestrian casualties per 100,000 people in the population				
All actions	0.24	0.21	0.33	0.27	0.22
Crossing road	0.18	0.14	0.28	0.19	0.17
Not crossing road	0.04	0.04	0.03	0.05	0.03

Figure 12.1 Comparison of pedestrian casualty rates according to whether pedestrian was crossing the road or not

a) Pedestrian road crossing casualties per 100,000 population per day



b) Pedestrian casualties not crossing the road per 100,000 population per day



that involved pedestrians who were crossing the road.

During the time of year when the survey was carried out there were, on average, 20 adult pedestrian road crossing casualties per day for every hundred million roads crossed and Table 12.2 shows that the introduction of a measure of exposure has increased the differences already seen in the rates per 100,000 people. The elderly were far more at risk while crossing the road than adults aged less than sixty, with casualty rates of 41 and 15 respectively, and men had a pedestrian road crossing casualty rate of 23 per hundred million roads crossed compared to the women's casualty rate of 18. These are the figures to be borne in mind as we go on now to look at the risks of being involved in a pedestrian accident in varying situations.

We shall be considering the variation in the casualty rate with respect to five different variables: the class of the road, whether the road was in junction with one or more others, whether the road had a one way or two way traffic flow, whether any kind of pedestrian crossing was provided and whether the road was in a built-up area or not.

12.2 Pedestrian casualty rates and road class

For the purpose of recording details about accidents, roads are divided into five classes: M, A(motorway standard), A, B, C or unclassified. Since comparatively few pedestrian accidents happen on motorway class roads we have grouped the first three classes together and called them 'A' class roads. Thus, when the pedestrian exposure data was being recorded the interviewer had to note, for each road crossed, whether it was an A, B or C or unclassified road.

There was an additional factor concerning the recording of road accident details which had to be taken into account when we were collecting the exposure data. Accidents which occur at, or within twenty yards of, a junction are classed according to the highest class of road at the junction. Thus although a pedestrian might have been crossing a C road when he was involved in an accident if the road was in junction with an A road within twenty yards of the place where the accident happended the accident would be classed as an A road accident.

In order that the exposure data might be comparable with the accident data the interviewers recorded the highest class of any roads in junction with the road crossed by the informant within twenty yards of the crossing point. At the analysis stage this information was used to produce an 'accident class' of road for each road crossed. It is this classification which is used when comparing the exposure and accident data.

A simple comparison of the number of pedestrian casualties for different road classes and the total mileage of each class of road, showed the pedestrian to be most at risk when crossing 'A' classified roads. Table 12.3 shows that this was also the case when using a measure of risk

Table 12.2 Pedestrian road crossing casualties per hundred million roads crossed

Pedestrian action	All persons	Age		Sex	
		18-59	60 and over	Male	Female
Crossing road	20	15	41	23	18

Table 12.3 Pedestrian road crossing casualties and casualty rates per hundred million roads crossed by 'accident class' of road

'Accident class' of road	Mean number of casualties per day	Mean number of roads crossed	Casualties per 100 million roads crossed
'A'	43.5	2.9	39
'B'	7.4	0.9	20
'C' or unclassified	19.8	5.1	10
All road crossings	70.8	8.9	20

Table 12.4 Pedestrian road crossing casualties and casualty rates per hundred million roads crossed by junction detail

Junction detail	Mean number of casualties per day	Mean number of roads crossed	Casualties per 100 million roads crossed
Within 20 yards of road junction	45.6	7.3	16
Elsewhere	25.0	1.6	40
All road crossings	70.8	8.9	20

based on the number of roads of each 'accident class' crossed.

The casualty rate decreased with the class of the road with the pedestrian having almost four times the risk of becoming a casualty when crossing an 'A' accident class road compared to when crossing a 'C' accident class road. This is much as one would expect as A roads in general carry heavier, faster traffic than do C roads.

12.3 Pedestrian casualty rates near junctions

Details concerning junctions are recorded for all accidents which occur within twenty yards of a junction. A large proportion of pedestrian accidents occur in these locations and previous studies have shown the pedestrian to be more at risk of an accident when crossing within twenty yards of a junction than when crossing elsewhere. Using the survey definition of risk, however, we found that the pedestrian was at more risk when crossing the road away from a junction (Table 12.4).

The table shows that a large number of roads were crossed within twenty yards of a junction (in fact, 82% of all roads crossed) and the figures indicate that the high number of accidents occurring near junctions merely reflects the high proportion of roads crossed there. It is perhaps interesting at this point to note that we also found that two out of every three roads crossed involved no change of direction for the pedestrian. This finding together with the high proportion of roads crossed near junctions seem to imply that people generally do not cross the road 'to get to the other side' but cross it merely because it cuts across their chosen path of walking.

This could also be one indicator of why our results are at variance with the findings of other studies. Previously most work has involved the selection of specific junction and non-junction sites, and the results have been obtained by observation. The survey data, however, originated from a sample of people and the junctions near which they happened to cross the road. It seems very likely that this might give a different sample of junctions from those selected for observation studies. Table 12.5 shows how the road crossings in the survey were distributed by class of road and whether there was a junction road. As we have already said about 80% of roads were crossed near junctions and Table 12.5 shows that over three quarters of these junction road crossings involved the crossing of a C or unclassified road. In fact almost a half (44%) of road crossings made by adult pedestrians involved the crossing of a C or unclassified road which was in junction with a similar road within 20 yards of the crossing point.

Table 12.5 Road crossings by class of road crossed and junction road

Class of:				
Road crossed	Junction road	%		Accident class
(a)	(b)			(c)
A or B	All classes	14	} 82	'A' or 'B'
C or U	A or B	24		
C or U	C or U	44		'C' or 'U'
A or B	—	5		'A' or 'B'
C or U	—	13		'C' or 'U'
		100		
Base (total number of roads crossed)		*63425*		

The large number of C road crossings together with the earlier point of people not changing direction when they crossed the road indicate that most road crossings at or near junctions involve the crossing of only minor side roads. It could be the case that the site studies tend to select the larger busier junctions which would be more dangerous for the pedestrian than the type of junctions the survey shows people were most likely to cross.

To overcome this problem we considered comparing the junction/non-junction casualty rates within road class so that we were comparing like with like. However, column (c) of Table 12.5, which shows how the road crossing would be classified if an accident happened demonstrates that road crossings made at 'A' or 'B' accident class junctions, in fact cover a large proportion of C road crossings. Although it was possible for us to separate the survey junction data by the class of road actually crossed, it was not possible to do this for the accident statistics since only one road class is recorded at a junction accident — that of the most major road involved.

Clearly further specific research would be needed to reconcile the survey and site study findings. However, Table 12.5 also demonstrates that away from junctions there is, of course, a direct correspondence between the class of the road crossed and the accident classification (last two lines of the table). Calculation of casualty rates for non-junction crossings shows the large effect road class has on the results, the rate per hundred million C or

Table 12.6 Pedestrian road crossing casualties and casualty rates per hundred million roads crossed by direction of traffic flow*

Direction of traffic flow	Mean number of casualties per day	Mean number of roads crossed	Casualties per 100 million roads crossed
Two way traffic	64.4	7.8	21
One way traffic	6.0	1.1	14
All road crossings	70.8	8.9	20

** Refers to the total traffic flow of the road ignoring any central refuges etc.*

Table 12.7 Pedestrian road crossing casualties and casualty rates per hundred million roads crossed by pedestrian action

Pedestrian action	Mean number of casualties per day	Mean number of roads crossed	Casualties per 100 million roads crossed
Crossing at pedestrian crossing	10.0	0.6	41
Crossing elsewhere	60.8	8.3	19
All road crossings	70.8	8.9	20

unclassified roads crossed away from junctions being 16 compared with a casualty rate of 100 casualties per hundred million A or B roads crossed away from junctions.

12.4 Pedestrian casualty rates and direction of traffic flow

Very few accident happen on one way roads which is not particularly unexpected as they cover much less mileage than two way roads. However, the casualty rates showed that, when the numbers of different types of roads crossed were taken into account, one way roads still appeared to be safer for the pedestrian to cross (Table 12.6). The difference seen in this Table was not as large as those seen between different accident classes of road or whether the road was in junction with another or not, but it was still large enough to suggest that one way roads were, in fact, safer for the pedestrian than two way roads.

12.5 Pedestrian casualty rates at pedestrian crossings

The fourth factor which can vary according to where the pedestrian crossed the road is the provision of a pedestrian crossing. In the recording of accident the term pedestrian crossing comprises: Zebra crossings, pedestrian traffic lights of all kinds, traffic signals which include a pedestrian phase and any manually controlled crossing. In some cases Zebra crossings may be 'manually controlled' but this latter group mainly consists of crossings which are solely designated by the presence of an authorised person. The method of collection of the survey data did not allow us to include this type of crossing but all other types were recorded. Table 12.7 shows the casualty rates for pedestrians crossing the road at pedestrian crossings.

It would appear from Table 12.7 that by defining risk as the number of casualties per hundred million roads crossed the pedestrian is more at risk when crossing at a pedestrian crossing than when crossing elsewhere, which is clearly not the result one would expect nor is it in agreement with the results of other studies. The difference could once again be due to selecting people and looking at the crossings they made rather than selecting crossings.

Pedestrian crossings are generally sited where crossing the road would otherwise be difficult or dangerous and previous site studies have generally compared the pedestrian crossing with a site on the same road. They are therefore comparing fairly similar stretches of road and have shown that crossing at the pedestrian crossing is safer. In our study, however, we had a sample of people and the road crossings they made. Thus when we divided the road crossings into those made at a pedestrian crossing and those which were not, the latter group comprised a whole range of different road crossing situations many of which involved the crossing of minor roads which we have already shown are associated with much less risk for the pedestrian.

In Table 12.8 we look at the casualty rates for crossing the road at a pedestrian crossing and crossing elsewhere for major and minor roads separately, to try to reduce the heterogeneity of the non-pedestrian crossing group.

Table 12.8 Pedestrian road crossing casualty rates per hundred million roads crossed by accident class of road and pedestrian action

Pedestrian action	Accident class of road	
	'A' or 'B'	'C' or unclassified
Crossing at pedestrian crossing	43	31
Crossing elsewhere	33	9

As we expected, the difference between the casualty rates for pedestrian crossings and elsewhere is much reduced from the overall level when looking at major roads only. For the 'C' roads, however, the difference is larger than that seen overall.

Pedestrian crossings, as we have said, are generally sited in places where the pedestrian is considered to be at risk and this usually means locations on major roads. A crossing which is sited on a 'C' road is therefore fairly unusual and probably indicates a particularly difficult road to cross. Thus a higher casualty rate may be seen for crossings at these pedestrian crossings than for crossings made on other quiet, safe 'C' roads but it is likely that the pedestrian casualty rate would be even higher at these sites if the pedestrian crossings had not been provided. Statistical evidence for this hypothesis would require a 'before and after' study. It must also be noted that since there are not very many pedestrian crossings on 'C' roads the figures which were used to calculate this casualty rate were rather small and therefore subject to greater random error than other figures used and presented.

12.6 The variation in casualty rates with age and sex

As well as assessing the variation in the overall casualty rates for pedestrians crossing roads in different situations we are also looking for an explanation of the differences in the rates for men and women, and older and younger people. Since we know that pedestrians were at more risk crossing in some situations than in others it could be that men or the elderly, who both have higher casualty rates crossed the road in these situations more often. For example men may have a higher casualty rate than women because they may cross more 'A' roads. If this were the case then a comparison of the risks for similar road crossing situations should reveal no differences. Table 12.9 presents for the two sexes and the two age groups the casualty rates we have been looking at in the previous section.

Table 12.9 Pedestrian road crossing casualty rates per hundred million roads crossed in different road situations by age and sex

Road situation	Pedestrian casualty rates per 100 million roads crossed				
	All persons	Age		Sex	
		18-59	60 and over	Male	Female
Within 20 yards of a junction	16	12	32	18	14
Elsewhere	40	28	92	46	35
'A' or 'B' road	34	26	60	37	32
'C' or unclassified road	10	7	23	12	9
Two way traffic	21	15	43	24	19
One way traffic	14	10	28	17	12
Crossing at pedestrian crossing	41	31	77	45	40
Crossing elsewhere	19	14	38	22	16
All road crossings	20	15	41	23	18

Calculation of the casualty rates for different types of road crossing did not reduce the overall differences already seen between the two age groups and the two sexes, nor was the relationship between the casualty rates for different road situations changed to any great extent.

People aged sixty or more had casualty rates between two and three times greater than those of adults aged less than sixty and men had a slightly higher casualty rate than women for every road situation. When looking at individual road situations the elderly were most at risk when crossing the road away from a junction with a casualty rate as high as 92 casualties per hundred million roads crossed, while for the younger adults there was very little difference between the rates for crossing at a pedestrian crossing, crossing not within twenty yards of a junction or crossing a major road.

The combination of road situations which produced a very high rate overall was crossing a major road away from a junction and when we look at this for the young and old separately it is again associated with very high risks. Among people aged eighteen to fifty-nine there were 74 pedestrian casualties per hundred million 'A' or 'B' roads crossed away from junctions while for the elderly the corresponding figure is 194.

We have thus shown that it is not the varying nature of exposure to risk that leads to the higher overall risks of the elderly and men when crossing the road.

12.7 Pedestrian casualty rates and type of area

There is one more road variable known to be related to the variation in the number of pedestrian casualties which we have not yet looked at: whether the road is in a built up area or not. For accident reports a road is defined as being in a built up area if it has a speed limit of thirty or forty miles per hour. This information was collected during the interview rather than during the observation part of the study.

This method of collection presented the same problems as were described for the data relating to whether the person was alone or not, ie, that 'type of area' was only known for groups of roads and not for individual roads. Three categories of informants were defined: those who did all their walking in built up area, those who walked only in non-built up areas and those who walked in both types of area on their sample day. An estimate of the number of roads crossed in each type of area was then made for the people who had walked in both types of area. This estimate was based on the assumption that the total number of roads crossed by these people could be apportioned in the ratio of the average number of roads crossed by people who walked only in built up areas to the average number crossed by people who walked only in non-built up areas. Adding this estimate to the known numbers of roads crossed by people who walked wholly in one type of area or another gave an estimated number of roads to be used in the calculation of risk.

The results are shown in Table 12.10. In this table we have returned to using the total number of casualties in the rate calculation and using the number of roads crossed as an estimate of overall pedestrian exposure.

Table 12.10 Pedestrian casualties and the estimated casualty rates per hundred million roads crossed by type of area

Type of area	Mean number of casualties per day	Estimated mean no. of roads crossed	Casualties per 100 million roads crossed
Built up area	88.9	8.63	26
Non-built up area	6.1	0.28	55
All areas	95.1	8.91	27

Using the estimated number of roads crossed in built up areas and non-built up areas as a measure of pedestrian exposure shows that whereas 94% of adult pedestrian casualties occur in built up areas, pedestrians are, in fact, at twice the risk of becoming a casualty in a non-built up area as in a built up area.

In general terms, then, we have shown that the high numbers of pedestrian accidents associated with particular road situations are due mainly to the high frequency of pedestrians crossing in such situations rather than to a high casualty rate. The main exception to this rule is road class (as defined for accidents) where 'A' class roads have the highest average number of casualties and also the highest risk attached to them.

12.8 Comparison of pedestrian casualty rates

Finally in this chapter we make a few comparisons between the road crossing information and data discussed elsewhere in this report.

Table 12.11 provides a comparison of different pedestrian casualty rates for the two sexes and the two age groups. At the beginning of this chapter we discussed the variation in the casualty rates between accidents which happened when the pedestrian was crossing the road and those which happened when he was not.

Included in the 'non-road crossing' category were pedestrians who were on a footpath or refuge at the time of the accident and also those who were in the road but not crossing it such as people alighting from vehicles, people working in the road or people who stepped into the road to avoid an obstruction on the footpath.

We saw that men had a higher casualty rate per head of population for non-road crossing accidents and that it has been suggested that this may be because men more often have jobs that involve them being in the road. This difference also leads to the difference in the casualty rates between men and women being larger for the overall casualty rate per hundred million roads crossed than between the casualty rates for road crossing accidents. (See Table 12.11 line (ii) and (iii)).

We saw in Chapter 11 that there was vitually no difference between the daytime pedestrian casualty rate of men and that of women, and that the overall difference arose mainly from a difference between the male and female casualty rates at night (Table 12.11 lines (iv) and (vi)). During the period of the survey normal working hours fell wholly in the daylight so, if the suggested explanation of why men had more 'non-road crossing' accidents was correct, the difference between the male and female casualty rates for the daylight accidents which happen while the pedestrian was actually crossing the road should be less than the overall difference between the daylight casualty rates. We can see from Table 12.11 lines (iv) and (v) that this was the case. In fact there was no difference between the casualty rates per hundred million roads crossed by men and women for accidents which happen in the daylight while the pedestrian was crossing the road. It should be noted that for about 10% of pedestrian casualties the pedestrian action was not known. However, as this proportion was similar for both men and women it should not affect these comparisons.

Although the last result was expected, the calculation of equivalent rates for the hours of darkness produce similar results which were not expected. The difference between men and women in the night-time casualty rates per hundred million roads crossed for accidents where the pedestrian was actually crossing the road was less than the difference between the overall rates for accidents which happened in the dark (Table 12.11 lines (vi) and (vii)). One possible explanation of this relates to the inclusion in non-road crossing accidents of pedestrians who were knocked down while alighting from vehicles. Since men were more likely to be driving than women they were also more likely to be alighting from a vehicle into the road. At night when conspicuity is poor it seem possible that this might have lead to an increase in the risk of being involved in a pedestrian accident.

It is also possible that the instructions given to the police on the classification of pedestrian accidents into 'road crossing' and 'non-road crossing' may provide some explanation of this. It can be seen from the following extract from the instructions that the definition of the category of people who were classed as being in the road but not crossing it could possibly lead to an artificially inflated number of 'non-road crossing' accidents.

'Codes 12, 11 or 0 (crossing road) are to be entered *only* if there was a *clear indication* that the pedestrian intended to get to the other side of the road. If a person stepped or

Table 12.11 Comparison of pedestrian casualty rates

Pedestrian casualty rate	All persons	Age		Sex	
		18-59	60 and over	Male	Female
(i) Casualties per 100,000 people	0.24	0.21	0.33	0.27	0.22
(ii) Casualties per 100 million roads crossed	27	21	50	33	23
(iii) Road crossing casualties per 100 million roads crossed	20	15	41	23	18
(iv) Casualties in light per 100 million roads crossed	22	16	43	24	20
(v) Road crossing casualties in light per 100 million roads crossed	16	11	35	17	16
(vi) Casualties in dark per 100 million roads crossed	61	53	111	70	48
(vii) Road crossing casualties in dark per 100 million roads crossed	45	37	98	49	39

ran onto the road or was walking on the road though there was *no evident intention* to cross Code 1 ('in road, not crossing') should be entered' *(Our italics). It seems that there may be a need for some further investigation as to how this instruction is used.

Table 12.11 also presents the results for the two age groups. The exclusion of accidents which are classified as happening when the pedestrian is not crossing the road causes some variation in the relationship between the casualty rates for the two groups. However, while the exclusion of these accidents results in an elimination of the difference between the male and female casualty rates it increases the difference between the rates for the eighteen to fifty-nine year olds and those aged sixty and over.

12.9 Summary

Separating the pedestrian casualty rate per head of pedestrian by whether the accident happened when the pedestrian was crossing the road or not shows that the variation with age which has been seen previously occurred mainly for the road crossing casualty rate. When the casualty rate for different road crossing situations was calculated using the corresponding road crossing exposure measures the pedestrian was found to be most at risk when crossing an 'A' road or when crossing away from a junction. The variation with age and sex were similar to those we have seen overall showing that the different casualty rates for the old and young were not due to variations in their road crossing patterns. Using an estimate it was also found that the pedestrian was more at risk when walking in a non-built up area than when walking in a built up area. This chapter shows that in general road situations which are associated with a large number of accidents such as junctions or roads in built up areas have this association because of the large number of road crossings made in these places. In looking at the combination of data from this chapter with data from other chapters it was shown that there was no difference between the casualty rates of men and women for road crossing accidents that occurred in the daylight and that the overall difference arose from accidents that happened when the pedestrian was not crossing the road and a difference in the risk of crossing the road at night.

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* Department of the Environment (Statistics Transport A Division). *Instructions for the completion of road accident reports.* (1975). Although these instructions have since been revised it is still the case that accidents, where there is doubt concerning the pedestrian action, are coded as 'in road, not crossing'.

13 Accidents and near accidents

In the last few chapters we have been comparing the pedestrian activity measures collected in the survey with accident statistics provided by the Transport and Road Research Laboratory. It was felt, however, that the opportunity should also be taken to ask the people interviewed about the circumstances of any accidents they themselves had been involved in as pedestrians. However, the accident statistics show that in each year approximately one adult per thousand in the population is involved in a pedestrian accident, so an unweighted sample size of two and a half thousand people would produce only very few accident victims.

One possible method of increasing the size of this group is to include people who have been in a 'near accident' as a pedestrian and to ask them about the circumstances. This also enables consideration to be given to the suggestions that what is a 'near accident' for a younger adult might become an actual accident for an older person, and this might be part of the reason that a greater proportion of elderly people become pedestrian casualties.

The informants were asked whether they had ever been involved in a road accident as a pedestrian or if they had been in a situation where they felt they were close to being knocked down. If they had they were asked to describe the circumstances. These questions were asked only of those people who could go out on foot.

As we expected there were very few people in the sample who had ever been involved in a pedestrian accident as an adult, but about a third of all people could describe a situation where they felt they were close to being knocked down. Since we were asking about experiences in adult life the average length of time under consideration by people aged 60 or more was substantially longer than for the people in the younger age group. Thus in addition to any real difference in the population casualty rates of the elderly and those of younger adults one might expect a greater number of incidents to be mentioned by the elderly (although memory problems also need to be taken into account). However the proportion of people who had been in a 'near accident' was, in fact, slightly larger among the adults aged less than sixty than among the older adults while a higher proportion of the elderly than of young adults said they had actually been involved in a pedestrian accident.

Table 13.2 shows the variation in the circumstances which resulted in the informant being knocked down or feeling close to being knocked down.

The most frequently mentioned pedestrian action at the time of the accident or 'near accident' was simply 'crossing the road'. This was mentioned by 26% of people who had been in a dangerous situation as a pedestrian, 25% said they were crossing at a pedestrian crossing or lights, 14% were crossing at or near a junction and 13% said they were crossing the road without looking. Slightly more younger adults than those aged sixty and over said they were crossing at a pedestrian crossing of some type. One other difference of interest occurs with age, a greater proportion of adults aged less than sixty said they were crossing the road without looking when the accident or 'near accident' occurred.

Table 13.1 Pedestrian accidents and 'near accidents' by age and sex

Have you as an adult ever been or felt quite near to being knocked down by a vehicle?	All persons	Age		Sex	
		18-59	60 and over	Male	Female
	%	%	%	%	%
Knocked down	3	2	6	2	3
Near miss	33	34	30	34	33
Neither	62	63	57	62	61
Cannot go out on foot	2	1	7	2	3
	100	100	100	100	100
Base	*7120*	*5188*	*1932*	*3339*	*3781*

Table 13.2 Four most frequently mentioned pedestrian actions at the time of the accident or 'near accident'

What were you doing?	All persons	Age		Sex	
		18-59	60 and over	Male	Female
Crossing the road	26%	24%	30%	22%	29%
Crossing at pedestrian crossing	25%	27%	20%	22%	28%
Crossing at or near junction	14%	13%	15%	16%	12%
Crossing without looking	13%	16%	8%	14%	13%
Base (people who have been or felt close to being knocked down)	*2565*	*1876*	*689*	*1193*	*1372*

Table 13.3 Four most frequently mentioned vehicle manoeuvres at the time of the accident or 'near accident'

What was the vehicle doing?	All persons	Age		Sex	
		18-59	60 and over	Male	Female
Travelling along the road	27%	27%	25%	28%	26%
Travelling too fast	24%	22%	30%	22%	26%
Turning a corner	23%	22%	25%	23%	22%
Ignoring lights or a crossing	19%	20%	16%	18%	19%
Base (people who have been or felt close to being knocked down)	*2565*	*1876*	*689*	*1193*	*1372*

Table 13.4 The four most frequently mentioned combinations of circumstances at the time of the accident or 'near accident'

Combination of circumstances	All persons	Age		Sex	
		18-59	60 and over	Male	Female
Crossing at pedestrian crossing, vehicle ignoring crossing	17%	18%	15%	17%	18%
Crossing without looking, vehicle travelling along the road	11%	12%	6%	12%	9%
Crossing the road, vehicle travelling too fast	11%	10%	11%	10%	11%
Crossing at junction, vehicle turning a corner	11%	10%	13%	14%	8%
Base (people who have been or felt near to being knocked down)	*2565*	*1876*	*689*	*1193*	*1372*

Table 13.3 shows the four most frequently mentioned vehicle manoeuvres at the time of the accident or when the informant felt close to being knocked down.

Among the people who had been in a dangerous situation as a pedestrian 27% said the vehicle was just travelling along the road and then, generally, went on to say that the situation arose because of the action of the informant himself. About one in four people said that the vehicle was travelling too fast and in just under a quarter of cases said the vehicle was turning a corner. There were 19% of cases where the vehicle ignored traffic lights or people waiting at a pedestrian crossing. The main variation in the frequency of situations mentioned between two age groups was that more older people were involved in an incident where they felt the vehicle was travelling too fast (30% compared to 22% of younger adults). Since the only measure of the speed of the vehicle we have was from the informants this result could in fact be an indication of the greater difficulties experienced by the elderly in judging the speed of modern traffic. There was very little difference between the results for men and women.

Lastly in this chapter we look at the combination of pedestrian action and vehicle manoeuvres that resulted in accidents or 'near accidents'. Once again we look at the four which were most frequently mentioned.

The most frequently mentioned combination of circumstances which lead to a pedestrian accident or 'near accident' was that which took place at a pedestrian crossing or lights when the pedestrian was trying to cross and the vehicle ignored the pedestrian's right of way.

Other combinations of circumstances mentioned were that the pedestrian was crossing without looking while the vehicle was just travelling along the road; that the pedestrian was crossing and the vehicle was travelling too fast, and that the pedestrian was crossing at a junction while the vehicle was turning the corner. All these combinations were mentioned by 11% of the people who had been in dangerous situations as pedestrians.

Thus 62% of informants had neither been knocked down nor could recall an incident in which they considered they were near to being knocked down. Of those who had been in this situation the most frequent combination of circumstances was that of the pedestrian trying to cross on a pedestrian crossing and the driver being described as ignoring the crossing.

Summary

When asked about pedestrian accidents and 'near accidents' 3% of people said they had actually been knocked down by a vehicle during their adult life and about a third said they had felt close to being knocked down. As would be expected more elderly people than younger adults had actually been involved in a pedestrian accident. The most common combination of circumstances which resulted in these situations was that of the pedestrian trying to cross at a pedestrian crossing and the vehicle ignoring the crossing.

14 Conclusions

This report presents the results of a study designed to provide basic data about the amount people go out and about on foot and to investigate the relationship of pedestrian activity and pedestrian accidents. The project was particularly concerned with the variations in the pedestrian casualty rates with respect to age and sex and whether the introduction of a measure of pedestrian exposure into the calculation of the casualty rates would serve to equalize the rates.

The measures of pedestrian exposure which were used took account of the time spent walking, the distance walked and the number of roads crossed. Also recorded were a number of items of information about each road crossed, some of which were equivalent to the information recorded on the Stats 19 accident form completed by the police. Because of the widespread sample and the method used to collect the data it was not possible for us to collect all the information recorded in the accident statistics. Items such as weather conditions and the traffic density could not be recorded although, in fact, these have some bearing on the likelihood of pedestrian accidents occurring. We were able on the other hand to record extra pieces of information which are not collected by the police (for example whether the informant was walking alone or not) which might provide the basis for further research. The data presented in this report show the results of the research which include a description of the patterns of pedestrian behaviour.

The survey results showed that, in general, younger adults (ie those aged eighteen to fifty-nine) experienced greater pedestrian exposure than older people and women experienced greater pedestrian exposure than men. When looking at other personal characteristics we found that single people had the greatest overall pedestrian activity level. Further analysis showed that the pedestrian activity of men was influenced by the greater car usage among men than among women. This occurred to such an extent that it would appear that men would probably have a greater overall pedestrian activity rate than women if there were no cars or if car availability and usage were as high among women as it is among men.

We have found that differences in pedestrian exposure do not generally explain the differences in casualty rates between the young and the old and men and women. Indeed, in most cases the inclusion of a measure of pedestrian exposure into the calculation of the casualty rate increases the differences. We did, however, find one group of people for whom the inclusion of a measure of pedestrian activity did reduce the casualty rate compared with other groups. These were men aged eighteen to twenty-nine.

We also found that the variation in the casualty rate with day of the week is related to pedestrian exposure. Sunday was a day of very few accidents but also a day of very low pedestrian activity. Thus when the casualty rate per unit of pedestrian exposure was calculated there was very little difference between Sunday and the rest of the week apart from Friday which we found was a day of high risk. The difference on Fridays was explained by the variation of the risk throughout the day. On Monday to Thursday there was a higher casualty rate during the day than on a Saturday when the opposite was true for the late evening. However Friday had the high daytime rate of a Monday to Thursday together with the high night time rate of a Saturday leading to an overall higher rate.

Having seen that exposure in general terms does not show the relationships with the casualty rates for men and women of different ages that might lead to explanations of the differences we turned to look at other variations both by looking at more detailed and varied definitions of exposure and by looking at judgement, physical ability and attitudes towards being a pedestrian.

As one looks at the sections on how people perceive themselves as pedestrians and the comments they make about other road users there is a general impression that men take slightly more risks and are generally less cautious than women when it comes to crossing the road. Although there were no large variations, each small difference found tended to support this view. More men think they walk faster than other people, slightly more of them say they very often cross the road diagonally, fewer of them say they are very cautious when crossing the road and slightly more of them complain that at Pelican crossings 'you have to wait for the lights'. All of these differences suggest a degree of impatience and therefore perhaps a greater likelihood of taking additional risks which could eventually lead to involvement in a pedestrian accident.

Of course, when these results were investigated for younger and older people the elderly show all the signs of caution and taking care in crossing the road so there are obviously other factors at work here. It may be that, although the elderly know what they should do, when they are actually faced with a physical situation their ability, both mental and physical, is not sufficient to cope with present day traffic. It will be interesting to see as time goes on whether elderly people will always have a lot more difficulty or whether their present reported difficulties in coping with the traffic are partly due to the massive change in conditions between the present day and sixty years ago.

As one would expect we found more people aged sixty and over who had actual physical difficulties in walking. This, together with any judgement problems they might have, must put them at more risk of being involved in a pedestrian accident. One interesting result we have found is that people did not seem to realise the importance of being able to hear well when crossing the road and this might further explain the high casualty rate among the elderly.

In addition to looking at pedestrian exposure in general we also looked at pedestrian exposure at different times of day and for different types of road crossing. We found that the difference in the casualty rates between men and women was far larger for accidents which happen in the dark than in the day light and, indeed, when allowance is made for the fact that more men than women have jobs that might lead to them being in the road the difference between the daylight casualty rates for men and women disappears. We found that men cross twice as many roads alone at night as women do and this, in the light of comments made above about attitudes, might well contribute to their higher accident rate at night. There are, of course, other factors. The conspicuity of the pedestrian at night is likely to be a contributary factor. The casualty rate was also found to increase dramatically between ten and twelve o'clock at night and it is likely that it is not only drivers who are around at this time who are affected by alcohol but pedestrians as well. All these different factors must contribute to the overall higher night time casualty rate found among men.

When contrasting the risk of crossing the road at different places we found that many situations, such as junctions or built up areas, which are associated with a large number of road accidents are also associated with a large number of road crossings. This means that although these places have previously been shown to be dangerous we found that the risk per road crossed was actually less than elsewhere. Main roads, however, which have a large number of accidents were also found to have a high risk associated with them.

In any discussion of the risk of being involved in a pedestrian accident, as based on pedestrian exposure, it is easy to forget the actual numbers involved. For example, we have shown that (using our definition of risk) an individual is at more risk when crossing a road away from a junction than when crossing near a junction. However during the field period of this survey 3205 pedestrians were injured in accidents near junctions compared to the 2041 pedestrians who were involved in accidents away from junctions. Thus although it may be safer per road crossing to cross at a junction, junctions are in fact the scene of many more accidents. So those who are responsible for safety campaigns need to be aware of both kinds of situation — those that are the most dangerous *per se* and those where there is a relatively high frequency of accidents although the risks themselves are lower — and so design their campaigns appropriately.

TABLE SECTION

Table 1 Actual sample sizes of the different age groups by sex and day of the week

	All persons	Age						
		18-29	30-39	40-49	50-59	60-69	70-79	80 and over
All persons	2621	434	348	342	375	605	372	145
Male	1201	206	166	160	193	288	149	39
Female	1420	228	182	182	182	317	223	106
Tue-Thur	635	105	80	80	100	150	89	31
Friday	661	104	90	90	88	150	99	40
Saturday	661	104	90	81	101	156	90	39
Sunday	664	121	88	91	86	149	94	35

Table 2 Upweighted bases of means given in the text tables

	All persons			Male			Female		
	18-59	60 and over	All ages	18-59	60 and over	All ages	18-59	60 and over	All ages
All persons	5188	1932	7120	2512	827	3339	2676	1105	3781
Marital Status									
Married	4116	1128	5244	1982	678	2660	2134	450	2584
Single	908	184	1092	506	57	563	402	127	529
Other	160	615	775	22	91	113	138	524	662
Employment Status									
Full time	3192	267	3459	2288	250	2538	904	17	921
Part time	700	176	876	2	75	77	698	101	799
Not employed	1288	1481	2769	214	494	708	1074	987	2061
Car availability									
Car in household	3620	683	4303	1838	371	2209	1782	312	2094
No car in household	1568	1249	2817	674	456	1130	894	793	1687
Driving Licence									
Holds licence	2788	497	3285	1858	384	2242	930	113	1043
Used to hold	100	164	264	78	115	193	22	49	71
Never held licence	2256	1249	3535	568	324	892	1718	925	2643
Day of week									
Mon-Thur	2920	1080	4000	1416	468	1884	1504	612	2116
Friday	744	289	1033	364	122	486	380	167	547
Saturday	752	285	1037	354	110	464	398	175	573
Sunday	772	278	1050	378	127	505	394	151	545
Transport used									
Foot only	1012	528	1540	282	215	497	730	313	1043
Foot and public	566	259	825	218	90	308	348	169	517
Foot and private	1758	335	2093	1020	203	1223	738	132	870
Foot public private	486	59	545	186	22	208	300	37	337

	In employment		Not in employment	
	Married	Not married	Married	Not married
Male	2156	457	500	207
Female	1272	448	1312	743

Sub-groups do not always sum to the total because in a few cases questions were not answered.

Table 3 Mean activity measures by ten year age groups

	All persons	Age						
		18-29	30-39	40-49	50-59	60-69	70-79	80 and over
	Mean number of roads crossed per day							
All persons	8.9	11.3	10.7	8.1	8.5	8.1	5.8	2.9
Male	8.1	11.6	8.1	6.2	6.4	8.2	7.4	3.3
Female	9.6	11.1	13.2	9.7	10.6	8.0	4.8	2.9
	Mean time spent walking per day (mins)							
All persons	32.6	36.7	34.4	28.6	32.1	36.1	27.6	17.4
Male	26.9	33.1	23.2	20.7	23.5	31.3	31.0	25.7
Female	37.6	40.2	44.7	35.4	40.8	40.5	25.3	14.8
	Mean distance walked per day (kms)							
All persons	1.94	2.43	2.23	1.83	1.78	1.89	1.34	0.60
Male	1.82	2.51	1.77	1.58	1.31	1.99	1.66	0.84
Female	2.04	2.35	2.64	2.04	2.28	1.78	1.12	0.53
	Mean number of road sections crossed per day (safe points)							
All persons	9.6	12.3	11.4	8.7	9.1	8.8	6.3	3.1
Male	8.7	12.5	8.5	6.7	7.0	8.9	8.0	3.5
Female	10.3	12.0	14.0	10.4	11.2	8.7	5.1	3.0
	Mean number of paces taken by interviewer to cross roads per day							
All persons	108	142	124	100	102	100	71	36
Male	100	146	90	77	82	101	92	40
Female	116	137	154	120	123	100	57	35
Base								
All persons	*7120*	*1498*	*1176*	*1164*	*1350*	*1055*	*639*	*238*
Male	*3339*	*730*	*560*	*536*	*686*	*513*	*257*	*57*
Female	*3781*	*768*	*616*	*628*	*664*	*542*	*382*	*181*

Table 4 Overall activity measures by ten year age groups

	All persons	Age						
		18-29	30-39	40-49	50-59	60-69	70-79	80 and over
	All persons							
Cannot go out on foot	2	0	0	0	2	3	8	28
Not out on sample day	12	5	8	9	11	16	26	32
Out but no walking	16	14	16	27	16	13	7	5
Walked on sample day	70	81	76	64	71	68	59	35
	100	100	100	100	100	100	100	100
	Male							
Cannot go out on foot	2	0	0	0	3	3	5	18
Not out on sample day	9	4	6	6	10	14	18	32
Out but no walking	22	16	23	37	26	16	14	14
Walked on sample day	67	80	71	57	61	67	63	36
	100	100	100	100	100	100	100	100
	Female							
Cannot go out on foot	3	0	0	0	1	3	10	31
Not out on sample day	14	6	9	11	12	19	31	32
Out but no walking	10	11	9	18	7	9	3	3
Walked on sample day	73	83	82	71	80	69	56	34
	100	100	100	100	100	100	100	100

For bases see Table 3

Table 5 Mean activity measures for people who do some walking by ten year age groups

	All persons	Age						
		18-29	30-39	40-49	50-59	60-69	70-79	80 and over
	Mean number of roads crossed per day							
All persons	12.7	14.1	14.0	12.6	12.0	11.8	9.9	8.4
Male	12.1	14.6	11.3	11.0	10.4	12.1	11.8	8.8
Female	13.1	13.4	16.2	13.6	13.2	11.6	8.4	8.3
	Mean time spent walking per day (mins)							
All persons	46.3	45.3	45.0	44.5	45.2	52.8	46.8	50.0
Male	40.2	41.6	32.4	36.6	38.1	46.2	49.5	69.9
Female	51.3	48.6	55.1	49.8	50.8	58.9	44.8	43.2
	Mean distance walked per day (kms)							
All persons	2.76	2.99	2.91	2.85	2.51	2.76	2.26	1.73
Male	2.71	3.16	2.48	2.80	2.11	2.94	2.64	2.28
Female	2.79	2.84	3.26	2.88	2.83	2.59	1.98	1.54
	Mean number of road sections crossed per day (safe points)							
All persons	13.6	15.1	14.8	13.5	12.8	12.9	10.7	9.0
Male	13.0	15.8	11.9	11.9	11.4	13.2	12.8	9.4
Female	14.1	14.5	17.2	14.6	13.9	12.7	9.0	8.9
	Mean number of paces taken by interviewer to cross roads per day							
All persons	155	174	162	156	144	147	120	104
Male	149	184	126	136	133	149	146	108
Female	159	165	190	169	153	145	101	102
Base								
All persons	*5003*	*1216*	*900*	*748*	*958*	*721*	*377*	*83*
Male	*2236*	*580*	*400*	*302*	*424*	*348*	*161*	*21*
Female	*2767*	*636*	*500*	*446*	*534*	*373*	*216*	*62*

Table 6 Mean number of roads crossed in different situations by ten year age groups

	All persons	Age						
		18-29	30-39	40-49	50-59	60-69	70-79	80 and over
	Mean number of roads crossed at or within 20 yards of a junction							
All persons	7.3	9.3	8.6	6.8	6.8	6.8	4.9	2.3
Male	6.6	9.6	6.0	5.0	5.2	6.9	6.6	2.5
Female	7.9	9.1	11.1	8.3	8.3	6.7	3.9	2.4
	Mean number of roads crossed not within 20 yards of a junction							
All persons	1.6	2.0	2.1	1.3	1.7	1.3	0.9	0.6
Male	1.5	2.0	2.1	1.2	1.2	1.3	0.8	0.8
Female	1.7	2.0	2.1	1.4	2.3	1.3	0.9	0.5
	Mean number of A (accident) roads crossed*							
All persons	2.9	3.8	2.9	2.8	2.6	3.0	1.9	1.3
Male	2.6	4.0	1.9	1.8	2.2	3.0	2.6	1.7
Female	3.1	3.6	3.7	3.8	2.9	3.0	1.4	1.1
	Mean number of B (accident) roads crossed*							
All persons	0.9	1.1	0.8	0.9	0.9	1.0	0.8	0.4
Male	1.0	1.4	1.0	0.9	0.8	1.0	0.8	0.3
Female	0.9	0.8	0.7	1.0	1.0	1.0	0.8	0.4
	Mean number of C (accident) roads crossed*							
All persons	5.1	6.5	7.0	4.3	5.0	4.0	3.2	1.3
Male	4.5	6.2	5.1	3.6	3.4	4.2	3.9	1.3
Female	5.7	6.7	8.8	5.0	6.6	3.9	2.6	1.3
	Mean number of one way roads crossed							
All persons	1.1	1.4	1.1	1.1	1.1	1.1	0.7	0.1
Male	0.9	1.4	0.5	0.9	1.0	1.0	0.5	0.3
Female	1.2	1.4	1.6	1.3	1.1	1.1	0.8	0.1
	Mean number of two way roads crossed							
All persons	7.8	10.0	9.6	7.0	7.4	7.0	5.1	2.8
Male	7.2	10.3	7.5	5.3	5.4	7.2	6.9	3.0
Female	8.4	9.6	11.5	8.3	9.5	6.9	3.9	2.8
	Mean number of roads crossed at pedestrian crossings							
All persons	*0.6*	*0.8*	*0.6*	*0.7*	*0.6*	*0.6*	*0.5*	*0.2*
Male	*0.5*	*0.6*	*0.3*	*0.4*	*0.5*	*0.5*	*0.4*	*0.4*
Female	*0.8*	*0.9*	*0.8*	*0.9*	*0.8*	*0.6*	*0.5*	*0.2*
	Mean number of roads crossed not at pedestrian crossings							
All persons	8.3	10.6	10.2	7.4	7.8	7.5	5.4	2.7
Male	7.6	11.1	7.7	5.8	5.9	7.7	7.0	2.8
Female	8.9	10.2	12.4	8.8	9.8	7.4	4.2	2.7
	Mean number of roads crossed in daylight							
All persons	7.7	9.1	9.7	7.0	7.1	7.3	5.4	2.8
Male	6.5	8.7	7.0	4.8	4.9	7.2	6.6	3.1
Female	8.7	9.5	12.1	8.9	9.3	7.3	4.5	2.7
	Mean number of roads crossed in the dark							
All persons	1.2	2.2	1.0	1.0	1.4	0.8	0.5	0.1
Male	1.6	3.0	1.0	1.4	1.5	1.0	0.8	0.2
Female	1.0	1.5	1.0	0.8	1.3	0.6	0.2	0.1

* *The road crossings are classified as they would be in the case of an accident*

The following tables present the data on which the Figures throughout the text of the report are based.

Basis for Figure 1.1 Pedestrian casualties per 100,000 people in the population (1975)

	Age						
	15-19	20-29	30-39	40-49	50-59	60-69	70 and over
Male	158	103	78	79	81	100	171
Female	139	65	49	58	67	94	143

Basis for Figure 3.1 These data will be found in Table 3 of this Table Section.

Basis for Figure 10.1 Mean number of pedestrian casualties per day during September and October 1975

	Age							
	18-29	30-39	40-49	50-59	60-69	70-79	80 and over	All ages
All persons	23.9	11.2	11.3	12.8	15.1	14.9	5.9	95.1
Male	14.7	7.1	6.4	7.2	7.0	5.6	2.0	45.1
Female	9.1	4.1	4.9	5.7	8.2	9.3	3.9	50.0

Basis for Figure 10.2 Mean number of pedestrian casualties per 100,000 population per day

	Age							
	18-29	30-39	40-49	50-59	60-69	70-79	80 and over	All ages
All persons	0.26	0.17	0.18	0.20	0.26	0.42	0.45	0.24
Male	0.31	0.21	0.20	0.23	0.26	0.42	0.54	0.27
Female	0.20	0.13	0.16	0.17	0.26	0.42	0.41	0.22

Basis for Figure 10.3 Mean number of pedestrian casualties per day per 100,000 people in the population who can go out on foot

	Age							
	18-29	30-39	40-49	50-59	60-69	70-79	80 and over	All ages
All persons	0.26	0.17	0.18	0.20	0.26	0.45	0.62	0.25
Male	0.31	0.21	0.20	0.24	0.27	0.44	0.66	0.27
Female	0.21	0.13	0.16	0.17	0.26	0.52	0.59	0.26

Basis for Figure 10.4 Mean number of pedestrian casualties per 100,000 people in the population who do some walking on an average day

	Age							
	18-29	30-39	40-49	50-59	60-69	70-79	80 and over	All ages
All persons	0.31	0.22	0.28	0.28	0.38	0.71	1.28	0.34
Male	0.39	0.30	0.36	0.37	0.38	0.66	1.48	0.40
Female	0.24	0.16	0.22	0.21	0.37	0.71	1.18	0.30

Basis for Figures 10.5, 10.6 and 10.7

	Age							
	18-29	30-39	40-49	50-59	60-69	70-79	80 and over	All ages
	Mean no. of pedestrian casualties per 100 million kilometres walked							
All persons	105	77	98	112	137	312	744	125
Male	124	125	129	176	130	250	649	147
Female	84	48	76	75	144	372	779	107
	Mean no. of pedestrian casualties per 100 million hours spent walking							
All persons	417	298	377	375	429	906	1543	445
Male	563	554	594	587	496	803	1271	596
Female	296	170	263	253	380	991	1665	349
	Mean no. of pedestrian casualties per 100 million roads crossed							
All persons	22	16	22	24	32	72	152	27
Male	27	27	33	36	32	56	167	33
Female	18	10	16	16	32	88	144	23
	Mean no. of pedestrian casualties per 100 million road sections crossed							
All persons	21	15	21	22	29	66	143	25
Male	25	25	30	33	29	52	157	31
Female	16	9	15	15	29	82	135	21
	Mean no. of pedestrian casualties per 100 million 'interviewer road crossing paces'							
All persons	1.8	1.4	1.8	2.0	2.6	5.9	12.5	2.2
Male	2.1	2.4	2.7	2.8	2.6	4.5	13.7	2.7
Female	1.4	0.8	1.3	1.4	2.6	7.3	11.8	1.9

Basis for Figure 12.1

	Age							
	18-29	30-39	40-49	50-59	60-69	70-79	80 and over	All ages
	Mean no. of pedestrian road crossing casualties per 100,000 population per day							
Male	0.20	0.13	0.14	0.16	0.20	0.34	0.50	
Female	0.15	0.09	0.12	0.13	0.21	0.36	0.36	
	Mean no. of pedestrian casualties not crossing the road per 100,000 population per day							
Male	0.08	0.06	0.04	0.05	0.04	0.04	0.01	
Female	0.03	0.02	0.02	0.03	0.03	0.04	0.03	

APPENDICES

Appendix A The sample

A.1 Introduction

In all sample surveys two conflicting requirements have to be taken into account. The first is that interviews need to be geographically spread for an efficient sample and the other is that interviews need to be reasonably close together for efficiency of the interviewer. These two points were particularly important in this survey because too clustered a sample would have meant that people had all walked in the same area and yet the interviewer needed a fairly clustered sample to be able to complete the necessary observations for one informant whilst making contact with and interviewing others.

These reasons led to the choice of a sample of individuals selected in three stages using the new County Districts as the first stage, wards as the second and named persons as the third.

A.2 Sample Size

For the type of analysis of results envisaged in this survey it was felt that at least 1,000 people aged 60 years or over were needed in the sample. According to the mid-1974 home population estimates (on which projections were based): 10,658,000 of the GB population of 54,422,000 were aged 60 and over, 39,218,500 of the population were aged 18 and over.

A sample was thus required of $\frac{39,218,000}{10,658,000} \times 1000 = 3,700$ electors

A conservative estimate of the likely response rate of about 75% led us to accept that about 5,000 persons would need to be selected from the Electoral Register to be sure of carrying out interviews with 1,000 persons aged 60 and over.

A.3 Procedure

As outlined in Section 1.5 we needed to supply interviewers with quotas of addresses which were concentrated in a particular area to enable them to complete their work efficiently. Over the two month field period we wanted interviewers to be able to deal with work in 4 areas. From the piloting work we knew that interviewers would be able to deal with about 16 named individuals in two weeks. Taking into account these factors the sample design was such that 4 electoral wards were selected from each of 80 Districts. From each ward 16 electors were selected. The sample size was thus set at 80 x 4 x 16 = 5120 persons.

The County Districts were established in April 1974 for England and Wales and April 1975 for Scotland. Eighty areas were selected for the sample with probability proportional to the electorate in that District. From each district the four wards were selected, again with probability proportional to size. Finally 16 elector's numbers were selected from each ward. This procedure produced a sample of electors with a constant probability of selection for each individual.

A.4 Stratification

We used five stratification factors. Each one was used in turn to subdivide the list of all County Districts into strata from which selections could be made. Since at least one selection has to be made in any stratum not all stratifiers were applied in all regions. The final stratifier in each region was applied so that Districts were ordered by the stratifying variable. The variables used were as follows:

a. Region

The 80 Districts to be selected were distributed among the Registrar General's Standard Regions in proportion to the 1975 electorate. East Midlands and East Anglia were treated as one region. Some of the more remote parts of Scotland (Orkney, Zetland, Western Isles and parts of Argyll and Bute) were excluded from the Scottish region.

b. Economic indicator

The proportion of the domestic rateable value in a District accounted for by units of value greater than £400 was used to indicate the relative prosperity of each District.

c. Population density

This was taken as the number of persons per acre. Since the travel patterns of urban dwellers differ from those in rural areas this was a relevant factor.

d. Car ownership

Car ownership, expressed here as the proportion of households owning at least one car in the District, has an obvious influence on pedestrian experience.

e. Age structure

As the survey was concerned with the problems of the people in the over sixty age group, the proportion of the population aged sixty and over was a useful control. It is, however, a statistic which doest not vary greatly from District to District and so was used after the other stratifiers had been applied.

A.5 Sub-selection of people aged less than sixty

A sample large enough to contain 1000 people aged sixty and over would contain more people aged less than sixty than we needed for the analysis. In order to optimise the use of resources we therefore decided to interview everyone who was found to be aged sixty and over but only interview one in two of those people aged less than sixty. A very simple random method of excluding half the under sixties was adopted based on the serial number. All people with a serial number that was even were eligible for interview while people with an odd serial number were only eligible for interview if they were aged fifty and over. Although we were, in fact, interested in people aged sixty and over the limit was set at fifty so that any errors in the age given at the initial call would not result in the loss of someone who was in fact eligible. Those people who were aged between fifty and fifty nine and who had an odd serial number had a shortened version of the interview. The interviewers were asked to record the age group of people aged less than fifty who had an odd serial number thus providing us with the age distribution of the whole selected sample.

A.6 Selection of sample day

As the numbers of accidents were known to vary with the day of the week and we were aking informants about their pedestrian activity for one day only, we had to ensure a representative sample of days as well as of individuals. (In fact, we required a sample of days which included more weekend days, see Sections 1.6 and 1.7). Sample days were allocated to sampled individuals on a cyclical basis when their names were selected from the Electoral Register. Part of the serial number identified the relevant day.

A.7 Deficiencies of the Electoral Register

Although the Electoral Register is the most comprehensive list of names available for use as a national sampling frame it does have certain deficiencies. There are various categories of people who are not eligible to be listed on the register and others who are known to be under-represented. The first group comprises the under seventeeen, aliens, recent arrivals in the country, peers of the realm, prisoners and some mental patients. The second group is mainly composed of people who are very mobile (ie who are continually moving from one address to another), those who become eligible to vote during the life of the register, and also to some extent, those people in their late teens and early twenties who may not get included on the Electoral Register until they have settled down.

If a person moves during the life of the Register then he will not be on the Electoral Register at his new address. Most people, however, would have been registered at their old address which means that when selecting a sample of individuals some procedure has to be adopted to deal with people who have moved. The simplest method is to ascertain the selected person's new address and to try to interview them there. This can sometimes cause loss from the sample both when the new address is known and also when the person had moved to an area where there is nobody available to carry out the interview.

There are methods designed to compensate for the loss of people who have moved and cannot be followed for one reason or another, and of people who are not registered. However, since the interviewers were going to be involved in a novel and fairly elaborate observation procedure it was felt that we could not ask them to operate a complex sampling technique as well and therefore the simplest system was adopted.

Thus although the Electoral Register is the most comprehensive list of individuals available there are two main areas of concern in its use as a sampling frame, one being the number of young people who are not registered and the other is the difficulty of finding people who have moved from the address where they were registered. The effect of these two deficiencies is investigated in the next two sections.

A.8 Distribution of the sample

The age and sex distributions of the sample of people interviewed in the survey are presented in Tables A1 and A2. They are compared with the distributions which would have been expected from the 1975 population estimates taking into account the fact that people aged sixty and over were over sampled by a factor of two.

The distributions are liable to be affected by two sources of variation: the deficiencies of the Electoral Register which we have discussed in the previous section and the variable loss of different groups through non-response. We have shown (Appendix B) that the age distribution in terms of the proportion of people aged less than sixty and of those aged sixty and over is slightly affected by the loss of the non-responders but we do not have the information to look at the age distribution of the non-response in any greater detail than that.

Table A.1 Age distribution of sample

Age	Number in sample		Number expected*	
18-29	434	1499	490	1496
30-39	348		342	
40-49	342		329	
50-59	375		335	
60-69	605	1122	614	1125
70-79	372		374	
80 and over	145		137	
Total	2621		2621	

** Based on 1975 Population estimates (Revised) OPCS PPI No.2*

Table A.1 shows that the division of the sample into the two main age groups used in the analysis produces results very similar to those expected. However the difference between the sample distribution and the expected distribution for the detailed age groups is found to be significant at the 5% level by a χ^2 test. The largest discrepancy is seen in the eighteen to twenty-nine year old age group, there being 56 fewer people in this age group in the sample than would be expected from the population estimates. This loss is most probably due to the proportion of young people who are missing from the Electoral Register. As we have described in the previous section, this group included young people who have not yet registered and those who live in the 'bed-sitter belt' of cities or are otherwise generally mobile.

Table A.2 Age and sex distribution of sample

Age	Male				Female			
	Number in sample		Number expected*		Number in sample		Number expected*	
18-29	206	725	246	742	228	774	243	752
30-39	166		172		182		170	
40-49	160		163		182		165	
50-59	193		161		182		174	
60-69	288	476	279	459	317	646	336	668
70-79	149		142		223		233	
80 and over	39		38		106		99	
Total	1201		1201		1420		1420	

** See Table A.1*

Table A.2 shows the age and sex distributions of the sample and what would be expected from the 1975 population estimates. Once again there is no significant difference between the size of the main sub-groups used in the analysis and their expected size. The difference seen overall for the detailed age groups between the sample distribution and the expected distribution is found to be statistically significant for the men but there is no significant difference between the sample and expected distributions for the women.

A.9 Non response due to people who had moved

The response to the survey is fully described in Section 1.9 and estimates concerning the non-responders have been made and are presented in Appendix B. In this section we will consider loss of response only due to people who had moved. It was estimated that by the time the fieldwork of the survey was carried out 10% of the people on the Electoral Register would have changed their address. Although some of these people would still live in the same locality and would be easily traceable, other would have left the area completely and perhaps left no forwarding address. However, the response results show that people moving did not cause nearly as much of a loss of response as we had thought it might. There were 121 people who had moved and could not be traced and a further 24 people who had moved to an area where we were not able to supply an interviewer. These people comprised 3% of the sample. There is another group, however, which falls into a similar category and these are the people who had died or emigrated. There were 124 of these people, which means that all together we lost 5% of the sample for reasons connected with using the Electoral Register as a sampling frame of individuals.

A.10 Sampling Error

This sample design is three stage, stratified and not self weighting which leads to an underestimation of the size of sampling errors calculated using the formulae based on a simple random sample. In the next few sections we will look at these problems and present a method of calculating sampling error which takes into account the sample design used for this survey.

A.11 The calculation of sampling error based on a simple random sample

The variance of a population variable assuming simple random sampling can be estimated from the sample using:

$$s^2 = \frac{\sum_{i=1}^{n} (y_i - \bar{y})^2}{n-1}$$

Where n = number of elements in the sample each with a value y_i and
$\bar{y}$ = mean of these values

The estimated variance of an estimate of the mean value of y in the population depends on the number of observations that make up the sample and is given by:

$$\text{variance}\ (\bar{y}) = \frac{s^2}{n}$$

A.12 Calculation of sampling errors based on a three stage stratified design

The sampling errors given by the formula above do not take into account the three stage design or the stratification of the sample. Kish and Hess (1959)[1] describe a means of estimating the error due to the multi stage sample based only on the variance between first stage units.

The eighty first stage units were selected systematically within regions from lists ordered by the stratification factors. This type of design can be regarded as the selection of one unit from each of a number of 'implicit' strata. In order to calculate the variance it is necessary to 'collapse' adjacent strata so that in our calculations we have two first stage units per stratum.

All possible adjacent pairings are made so that 1 is compared with 2, 2 with 3, 3 with 4 and so on. Thus the calculations are based on L — 1 differences where L is the number of strata.

The formula is given for the ratio estimator $r = \frac{y}{x}$ (where x_i, y_i are values for two variables for the ith informant and x,y are the sums of these variables).

The estimated variance of r is given by:

$$\hat{\text{var}}(r) = \frac{1}{x^2}\ \frac{L}{2(L-1)}\left\{\sum_{\alpha=1}^{L-1} dy_\alpha^2 + r^2\sum_{\alpha=1}^{L-1} dx_\alpha^2 - 2r\sum_{\alpha=1}^{L-1} dy_\alpha\, dx_\alpha\right\}$$

Where:
L is the number of strata

$dy_\alpha = y_\alpha - y_{\alpha+1}$

$dx_\alpha = x_\alpha - x_{\alpha+1}$

x_α and y_α are the weighted totals of the x and y variables from stratum α.

Table A3 gives the standard errors calculated using the Kish and Hess formula for the fifteen basic variables used throughout the report.

Table A.3 Standard errors

Variable	Mean value	Complex design error
Mean number of roads crossed		
All persons	8.91	0.39
Age 18-59	9.73	0.46
Age 60 and over	6.70	0.47
Male	8.10	0.56
Female	9.62	0.48
Mean time spent walking (mins)		
All persons	32.57	1.37
Age 18-59	33.16	1.64
Age 60 and over	30.97	1.85
Male	26.90	1.64
Female	37.57	1.73
Mean distance walked (kms)		
All persons	1.936	0.079
Age 18-59	2.082	0.095
Age 60 and over	1.546	0.093
Male	1.816	0.115
Female	2.043	0.090

A.13 Comparing two means

Frequently we wish to examine the difference between two means, such as the difference between the mean number of roads crossed by men and the mean number crossed by women. The difference between two ratios (r - r′) has a variance of its own.

The estimate of the variance of (r - r′), Vâr (r - r′) is given by:

$$\hat{\text{Var}}(r) + \hat{\text{Var}}(r') - 2\,\text{Covariance}(rr')$$

Covariance (rr′) according to Kish and Hess (1959) is given by:

$$\text{Cov}(rr') = \frac{2}{xx'}\ \frac{L}{2(L-1)}\left\{\sum_{\alpha=1}^{L-1} dy_\alpha\, dy'_\alpha + rr'\sum_{\alpha=1}^{L-1} dx_\alpha\, dx'_\alpha - r'\sum_{\alpha=1}^{L-1} dy_\alpha\, dx'_\alpha - r\sum_{\alpha=1}^{L-1} dy'_\alpha\, dx_\alpha\right\}$$

Table A.4 gives the value of differences on three variables for two sets of subgroups. These are the difference between men and women and the difference between those aged 60 and over and those aged under 60. In addition the sampling errors of the differences based on the formulae outlined above are given.

Table A.4 Differences between the subgroups and the relevant sampling errors

	Age			Sampling error of (a)-(b)	Sex			Sampling error of (b)-(a)
	18-59 (a)	60 (b)	(a)-(b)		Male (a)	Female (b)	(b)-(a)	
Mean no. of roads crossed	9.73	6.70	3.03	0.55	8.10	9.62	1.52	0.71
Mean time spent walking	33.16	30.97	2.19	2.26	26.90	37.57	10.67	2.08
Mean distance walked	2.08	1.55	0.53	0.12	1.82	2.04	0.22	0.13

A.14 Calculation of sampling errors for the casualty rates

All the casualty rates presented in this report based on survey data have sampling errors associated with them. For example the number of pedestrian casualties per hundred million roads crossed is calculated using the average number of roads crossed in a day which is an estimate taken from the survey and which as we have seen in Table A.3 has a sampling error of 0.39. For the purpose of calculating sampling errors the number of pedestrian casualties and the size of the population has been taken as constant. The pedestrian casualty rate per exposure measure can thus be expressed as:

$$\frac{c}{\bar{x}}$$

where c is $\frac{\text{casualties}}{\text{population}}$ x 100 million

and $\bar{x}$ is the mean survey value of the exposure measure concerned.

Using the Taylor expansion of $\frac{1}{\bar{x}}$ the variance of $\frac{c}{\bar{x}}$ can be derived; $\hat{\text{var}}\left(\frac{c}{\bar{x}}\right) = \frac{c^2\ V(\bar{x})}{\mu^{\psi}}$,

Where μ is the population value, estimated from the sample by $\bar{x}$. Thus the standard error is given by $\sqrt{\frac{c^2\ V(\bar{x})}{\mu^{\psi}}}$

For example the pedestrian road crossing casualty rate per hundred million roads crossed has been calculated to be 20 (Table 12.2). The standard error of this figure is calculated as follows:

$c = 179.85$

$\bar{x} = 8.91$ (sample estimate of μ)

$V(\bar{x}) = (0.39)^2$ (Table A.4)

$$\frac{c^2\ V(\bar{x})}{\mu^{\psi}} = 0.781$$

Therefore s.e. $\frac{(c)}{(\bar{x})}\ \sqrt{0.781} = 0.88$

Thus the pedestrian road crossing casualty rate per hundred million roads crossed = 20 ± 2.

Although we have treated the number of accidents as a constant in order to facilitate the calculation of an estimate of the sampling error, it is, in fact, a figure which has a variance associated with it. Thus the actual sampling error could be slightly larger than we have calculated.

A.15 Comparison of figures in the text

Throughout the text, where two figures are categorically stated to be different this difference has been tested and found to be statistically significant at the 5% level. Any form of qualification, however, generally implies that the difference described did not achieve statistical significance.

Reference

[1] L Kish and I Hess. *On variances of ratios and their differences in multi-stage samples.* Journal of the American Statistical Association **54.** 1959.

Appendix B Calculation of a measure of pedestrian exposure for the non-respondents

B.1 Introduction

In order to calculate a measure of pedestrian activity for the total sample we needed estimates of similar exposure measures for both the respondents and non-respondents. For many surveys it is assumed that the non-respondents are similar to the respondents but since several of the reasons for non-response were closely allied to the subject matter of this survey this cannot be assumed here. For example, a sampled person who was classified as being "away all survey period" might have been out of the country or in hospital and thus have zero pedestrian exposure in our terms while a sampled person who could not be contacted because he was always out might have a high pedestrian exposure.

Any information that needs to be collected about non-respondents must be of a fairly simple nature since by definition the interviewer must have had some difficulty either in finding or in obtaining an interview with these people. For these reasons the measure of pedestrian activity for the non-respondents had to be fairly simplistic and was taken to be whether they had been out at all in the last month.

The interviewer was also asked to obtain as much classification information as possible about the non-respondents so that the variation in the estimated exposure meaure with respect to age, sex and so on could be investigated.

B.2 Outline of the method

The method of estimating the proportion of non-respondents who had been out at all during the last month relied in the first instance on the interviewer obtaining as much information as possible about each non-respondent.

The data then had to be weighted to allow for the differential sampling of different age groups and days of the week for eventual comparison with the response data. Part of the weighting procedure is dependent on the age of the informant so in cases where this was not known it had to be estimated.

Three assumptions were made where the age of the sampled person was not known. First that all people with an odd serial number were aged sixty and over; second that for people with an even serial number who refused or were away all survey period or were out at all calls, age was distributed in the same say as for those whose age was known; third for the people with an even serial number who had moved and could not be traced, age was distributed as in the distribution of 1971 census figures on migration.

There were, of course, some cases where the interviewer was unable to ascertain whether the non-respondent had in fact been out in the last month so estimates has to be made for these people.

Two methods were used in this estimation. The first was based on the assumption that the division of people into those who went out and those who did not is similar to that among the non-respondents for whom this information was obtained. The second method, as with the age estimation, took into account the reasons for non-response.

B.3 The information collected

The classificatory information that we endeavoured to obtain for the non-respondents included age, sex, marital and employment status, whether there was a car in the household and whether the sampled person held a driving licence. There were 526 cases of non-response and Table B1 shows for what proportion of non-respondents each of these pieces of information was in fact obtained. The table also includes the pedestrian activity question.

Table B.1 Proportion of non-respondents for whom information ascertained

Classification item	Information ascertained
Some pedestrian activity in last month	68%
Age	63%
Sex	94%
Marital status	59%
Employment status	56%
Car in household	47%
Driving Licence holder	36%
Base	*502**

** Of the 526 non-respondents 24 with odd serial numbers were aged between fifty and fifty-nine. From the sample design these people were eligible for a short interview but were to be excluded from the final analysis (Section 1.4). There were thus included as non-response at the interviewing stage (Table 1.2) but are excluded here.*

It is, of course, as commented earlier, very difficult to obtain all the required information for non-respondents for the very reasons that they are non-respondents. As might be expected the item of information most often ascertained was the sex of the informant (94% of cases). The pedestrian exposure information and the age of the non-respondent were ascertained in 68% and 63% of cases respectively. All other information was obtained for less than 60% of the non-respondents. The decision was made to discard this other information as combinations with the estimated exposure data would result in too great a proportion of the information being estimated. The analysis was therefore restricted to three variables only, the measure of pedestrian activity, age and sex.

B.4 Weighting the data

As we have already said in order to compare and combine the response and non-response exposure measures the non-response figures had to be weighted in the same way as the response figures. The weighting factor was determined by the sample design and was dependant on the sampled person's age and sample day. Information concerning the sample day was contained in the serial number and so was known for all the non-respondents, but, as we have seen in Table B1, the age was ascertained in only 63% of cases. Thus estimates of age has to be made for 37% of the non-respondents.

The weighting factor varies according to whether the sampled person was aged less than sixty or sixty and over, so we needed an estimate of the ratio of the number of people aged less than sixty to the number of people aged sixty and over. For the purposes of weighting, people whose ages were not known were subdivided into the two age groups according to the calculated ratio for each sample day separately, but for the initial estimation of the ratio we looked at all the sample days together.

B.5 Estimation of the age ratio

The sampling procedure was such that all people with even serial numbers were eligible for interview while of the people with odd serial numbers only those aged fifty and over were eligible for interview and of these, only the people aged sixty and over were to be included in the analysis (see Section 1.4). Thus it was possible to assume that people with odd serial numbers for whom age was not known were aged sixty and over on the basis that the interviewer may have ascertained whether the sampled person was eligible or ineligible in general age terms but might then have been unable to discover the eligible person's exact age. Clearly, in some cases the interviewer would not have found out any information about the age of the non-respondent and there would be other cases where the sampled person was included because he was aged fifty and over. However, although this method introduced some errors the lack of other information made it the best assumption to make in the circumstances.

This assumption could not, of course, be made for people with even serial numbers whose age was not known, but it was possible to divide these people according to the ratio of the two age groups among these non-respondents with even serial numbers whose age was known. However, the use of this ratio was only possible for three of the four groups of non-responders: those who refused to take part in the survey, those who were away all survey period and those who were out at all the calls the interviewer made. The interviewers managed to ascertain age (or an estimate) for most of the people in these three groups but for only 20% of the people who had moved and could not be traced. Thus using the overall ratio of the two age groups among non-respondents with even serial numbers whose age was known would have been equivalent to using the ratio of the known ages amongst people who had refused, were away or were out. It was important not to do this since it is known that people who move tend to be younger and so a ratio based on known ages would produce too many people aged sixty and over.

Thus, we used the ratio of known ages for the first three categories of non-response while the ratio for the people who had moved and could not be traced was calculated using the age distribution taken from the 1971 Census figures on migration. These two figures were then combined and the results are shown in Table B2.

Table B2 Estimation of age ratio

	No. of people age not known	No. of people estimated to be:	
		18-59	60 and over
Odd serial numbers	43	—	43
Even serial numbers			
Refusal	34	22	12
Away survey period	13	9	4
Out at all calls	13	11	2
Moved	81	70	11
Estimated age ratios			
Age ratio for people with odd serial numbers		0	43
Age ratio for people with even serial numbers		112	29

The two ratios were applied to the group of people for whom age was not known for each sample day separately and then the correct weighting procedure was carried out producing the weighted figures shown in the second column of Table B3.

Table B.3 Weighted non-response figures

Classificatory item	Unweighted figure	Weighted figure
Total	502	1435
Pedestrian activity		
Out in last month	271	771
Not out in last month	69	184
Don't know	162	480
Age		
18-59	164	1044
60 or more	154	391
Don't know	184	—
Sex		
Male	202	627
Female	268	718
Don't know	32	90
Day of the week		
Monday-Thursday	137	876
Friday	117	182
Saturday	130	199
Sunday	118	178

B.6 Estimation of non-response pedestrian exposure measure

Since information about pedestrian activity was available for two thirds of the non-respondents we used this on which to base the estimates of pedestrian exposure for the other third. Two methods were used: one based on the known distribution as shown in Table B3 and the other taking into account the reasons for non-response. Both of these calculations and their results are given here because, although it was felt that the second method gave a better overall estimate, it could not be used to give estimates of pedestrian activity for the two sexes and age groups separately.

B.7 First method of estimating a non-response pedestrian exposure measure

There were 480 people (weighted figures) for whom the pedestrian exposure information was not obtained and 955 for whom it was. Among this latter group 771 were said to have been out in the last month and 184 were said not to have been. Dividing the 480 people in this ratio leads to an estimate of a total of 1159 people having been out in the last month and 276 who had not.

Similar calculations were carried out for the people aged less than sixty and those aged sixty and over and for men and women separately. In all these cases certain assumptions had to be made where the relevant classification information was not available. For distributing the unknown ages the previously calculated ratio was used and in the cases where the sex of the non-respondent was not ascertained the group was divided according to the sex distribution in the 1971 census figures on migration as most of these people were in the 'moved no trace' category. The results of these calculations were then used to make overall estimates of the pedestrian activity of the total sample.

B.8 Second method of estimating a non-response pedestrian exposure measure

A large proportion of the people for whom the pedestrian activity information was not obtained were among the group who had moved and could not be traced. As we said previously this group tend to be composed of younger adults who we know have a higher level of exposure than the elderly. The second method of estimating exposure for the non-respondents for whom this was not known took this into account by dealing separately with the people who had moved and could not be traced.

For this calculation the unweighted figures had to be used. After excluding the people who had moved and could not be traced the other non-respondents for whom no exposure information was available were apportioned between the two exposure groups in the ratio of the size of these groups formed where the exposure information was known.

Out of the 141 people who had moved and could not be traced the interviewer managed to obtain pedestrian exposure information for only 18 of them, which meant it was not possible to use the known distribution to calculate the ratio of people who went out to those who did not. However it is likely that the only difference between the non-respondents who had moved and could not be traced and the people who were interviewed was their age distribution and once this was allowed for there was no reason why the pedestrian activity of the 'movers' should have been any different from that found among the respondents.

The people who had moved for whom we had no exposure information were separated into the two age groups. Where the age was not known it was estimated using the assumptions from the original age estimation (B5). The ratio of people who went out to those who did not was calculated for both age groups using the information from the equivalent groups of respondents. The ratios for the people aged less than sixty and for those aged sixty and over were then amalgamated to produce an overall estimate for the 'movers' for whom pedestrian exposure information was not ascertained. This ratio was then combined with the ratio for the other three groups of non respondents and the result applied to the weighted total of 480 people for whom information on pedestrian activity was not available. These totals were then added to the figures for the non-respondents for whom pedestrian exposure information had been obtained. By calculating the ratio on the original figures, where the elderly are over represented, and applying it to the weighted total, where the population is correctly represented, it is likely that the estimate of the proportion of non-respondents who have not been out in the last month is slightly high. Even so this is probably a better overall estimate of the non-respondents' pedestrian activity than the first estimate. However as this is a rather more complex method of calculation it cannot be used to look at the pedestrian activity of the two age groups and sexes separately. This estimate of the pedestrian exposure experienced by the non-respondents can then be combined with a suitable response measure to produce the best estimate of pedestrian activity for the total sample.

The final results and discussion are presented in Section 1.11 of the report.

Appendix C The calculation of distance walked as a measure of pedestrian activity

C.1 Introduction

The survey was designed to quantify the pedestrian activity of the adult population and we have used three different measures to do this: the time spent walking, the number of roads crossed and the distance walked.

An estimate of the time the informant spent walking on a given sample day was ascertained during the interview but the number of roads crossed was obtained by a technique of 'reconstruction' and observation. During the interview the informant was asked to describe exactly where he had walked on the sample day. Using this description the interviewer then had to retrace the route counting the roads she crossed and noting various items of information about them.

As the interviewers were to rewalk the routes and as we felt that people might find distance a difficult quantity to estimate, especially for very short walks, it seemed appropriate to use the interviewers to measure distance in some way. We considered the use of pedometers but felt this would introduce unnecessary complications and imply an accuracy greater than was justified, so we decided that the simplest way to calculate the distance was to use the time it took the interviewer to rewalk the route and some measure of her walking speed. However, the time taken by the interviewer from starting to finishing a walk included not only the length of time for which she was walking but also the time taken in completing the observation sheets. A method was therefore devised whereby this latter time could be calculated and actual walking time established by subtraction.

To ensure a consistant use of the definitions the interviewers had to record the crossing information in units of crossings made from 'safe point' to 'safe point' rather than for each complete road. 'Safe points' included centre islands and refuges as well as pavements and verges. Thus for each road crossed one or more lines of information had to be completed. Since each line required the same amount of information an estimate of the time taken to complete all the observation sheets for one walk could be calculated by multiplying the average time taken to complete one line by the total number of lines completed.

Thus, in order to calculate the distance walked we needed four separate measures:

(i) average time to complete one line
(ii) total number of lines completed for each walking section*
(iii) total time taken by interviewer from start to finish of walk
(iv) interviewer's walking speed

Quantities (ii) and (iii) could be measured in a straightforward way from information recorded by the interviewer. In the following sections we describe in more detail the measurement of quantities (i) and (iv) and the use of all four measures to derive a measure of distance.

C.2 Measurement of time taken to complete one line of information

We took initial measurements of the time taken to complete one line on the observation sheet during the pilot study, so that if there seemed to be large variations in the results we could repeat the timings at the main stage. However, the pilot times seemed to be fairly consistent and the layout of the observation sheet changed very little between the pilot and the main stages, so the pilot results were used in the calculation of the average time to complete one line.

For part of the pilot field period each interviewer was accompanied by a person whose job it was to time how long each line took to complete. The interviewers were instructed to ignore the 'time-keepers' as far as possible so that they recorded the information at a normal speed and did not discuss any difficulties. They had also been told to complete the requisite information regarding the whole road before they set out to cross it. This meant they were sometimes dealing with one set of 'safe points' (pavement to pavement) and sometimes more than one (pavement to refuge; refuge to pavement) so the number of lines of information to be completed for different roads varied. Thus as well as recording the time taken, the time-keeper also had to record the number of lines to which the time referred.

The time was measured from the moment the interviewer stopped to observe the road until she set off to cross it. We recorded times for 301 lines and calculated an average of 22.2 seconds per line. However we noticed that after the first few lines for each interviewer the recording time per line decreased. We attributed this partly to the recording process becoming more familiar and partly to the interviewer growing accustomed to being watched and timed. The average time, excluding the first ten lines for each interviewer was found to be just under 20 seconds per line. As the accuracy of the data could not be relied on to such a fine point we decided to use the nearest whole number of seconds and set the time to complete a line at 20 seconds.

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*Long walks were divided into sections by the interviewer

C.3 Measuring the interviewers' walking speeds

In order to make the measures of the interviewers' walking speeds comparable we needed to be able to time them walking over the same route. As they all had to come to OPCS Headquarters to be briefed a route was chosen and they were all asked to walk once around the block on which the building stands. This meant that they had no roads to cross and would return to where they started. It also meant that they were being measured under the conditions in which they would be rewalking the interview routes. They were asked to walk at their normal speed (as though they were setting out to walk about a mile) and they were sent off in alternate directions to prevent any bunching. A group of stewards timed them to the nearest second using stopwatches and the interviewers counted their own paces.

The length of the route was measured enabling us to calculate an estimate of interviewers' walking speeds. This procedure produced the following results:

Mean time taken to walk round the block = 3.7 minutes
Standard error = 0.3 minutes

Distance walked = 333.1 metres

These two results gave an overall average interviewer walking speed of 90 metres per minute.

As a slight refinement we also divided the interviewers into four groups according to the length of time they took to walk the set route and calculated the average interviewer walking speed of each group separately. The four values thus calculated were:

$$S_1 = 101\text{m/min}$$
$$S_2 = 92\text{m/min}$$
$$S_3 = 83\text{m/min}$$
$$S_4 = 76\text{m/min}$$

C.5 Calculation of distance walked

Having calculated the average interviewer walking speed we were then in a position to calculate an estimate of the distance walked by the informant for any one walking section using the equation:

$$d_i = S \times (t_i - l_i \times T)$$

where: d_i : distance walked in section i (metres)
S : mean interviewer walking speed (m/min)
t_i : total time taken for interviewer to rewalk section i (mins)
l_i : number of lines for section i
T: mean time taken to complete one line.

Substituting the different values of S into the distance calculation according to which interviewer did the walk gave an estimate for the distance walked by the informant which took some account of the variation of the interviewers' walking speeds. However, a comparison of the results for the distance walked as calculated using the overall average (D_a) and those calculated using the four grouped averages (D_g) showed very little difference between the two sets of results.

	Average distance walked	
Survey estiamtes for:	D_a	D_g
All persons	1.94	1.96
18-29	2.43	2.48
30-39	2.23	2.23
40-49	1.83	1.87
50-59	1.78	1.81
60-69	1.89	1.90
70-79	1.34	1.35
80 and over	0.60	0.61

As each interviewer had only been timed once we felt that it was preferable to use the overall average speed in the distance calculation.

C.5 Reliability of the estimate

The variables used in the calculation of distance were all subject to random error but it was felt that the total error introduced by using this method would be of no greater order of magnitude (and probably less) than that incurred by asking the informants themselves how far they had walked. The main advantage of this method is that it should eliminate the possibility of the systematic errors one might find when asking informants about distance, for example, it is likely that a group such as the elderly might tend to overestimate.

Appendix D Journey information

D.1 Introduction

In the first chapters of this report we set out the aims of the survey, what we were attempting to measure, the way in which we did it and what had to be sacrificed in order to achieve this.

One of the main sacrifices we had to make was that of detailed and accurate information about journeys. As journey information is generally important in travel surveys it was felt a report of this nature could not be produced without some discussion of the exclusion of journey data.

The main object of the survey was to measure how much people go out and about on foot which is a measurement omitted by many travel surveys because of the difficulty in obtaining it. As the intricate details of exactly where the person had walked were the most important data in this inquiry a little less emphasis was put on defining the journeys consistently than would usually be the case in a travel survey. For our purposes the division of travel into journeys was a means to an end not an end in itself.

There are several reasons therefore why we feel less reliance can be put on the journey information than on the walking information. Some of these are inherent in the design of the survey while others are due to deliberate policies carried out during the operational stages.

D.2 Reliability of Journey Data

As we have said, the purpose of this study was to measure pedestrian activity and so throughout the schedule the emphasis lay very heavily on walking. The title, introduction and questions prior to asking for the detail of the sample day were all concerned with the informant as a pedestrian. Although the interviewers were asked to probe very carefully for all journeys we feel that the pedestrian emphasis might have led to an increased likelihood of journeys with no walking parts being omitted by the informant. It is likely that this is particularly true for those people who said that they had no journeys at all on the sample day whereas they might in fact have had journeys which did not involve any walking. This would lead to a slight overestimate of the numbers of people who were said not to have gone out on their sample day and a corresponding underestimate of the numbers of journeys which contained no walking parts and so on. However, it will not have effected our estimate of pedestrian exposure.

In order to obtain the detailed description of the walking parts of the day the interviewers were asked to divide all travelling into journeys and then divide the journeys into walking and non-walking sections. The walking sections were further divided if the interviewers felt that it would make the collection of the necessary details easier.

The journeys were divided according to purpose so that each journey had one and only one main purpose. For the division of journeys into sections the only stipulation was that each section must be wholly on foot or contain no walking at all. Any further division was left to the discretion of the interviewers after we had advised them that short walking sections would be easier to manage than long ones.

The sections were designed to be used only as a method of getting to the final details of where the person had walked and there was never any intention of analysing anything by walking sections.

In this study it was more important to have the walking section divided into manageable lengths than for the day to be divided into journeys in the best possible way so more stress was placed on the division of the sections. We feel that this may have encouraged the interviewers to over divide journeys so that what would have been quite adequately described as one journey may have become two or more. This would lead to an overestimate in numbers of journeys of any sort but again would not have affected our estimate of pedestrian exposure.

These are the two main reasons inherent in the design of this study which we feel make the data about the number of journeys of various kinds less reliable than the data relating directly to pedestrian exposure. As we said previously these were not the only reasons as there were also some deliberate policies carried out at the coding and editing stage of the study which must have slightly affected the number of journeys recorded.

The interview schedule was designed to allow for each informant to have up to nine journeys and as many sections per journey as the interviewer wanted. If the informant had more than nine journeys the interviewer carried on to a second schedule.

For reasons of economy at the computing stage and for ease in handling the data we decided that no informant should have more than nine journeys and no journey should have more than nine walking sections, and so decisions had to be taken on how to amalgamate some of the data if necessary.

When an informant had more than nine journeys on his sample day the information about some of the journeys having the same purpose was combined as many times as was necessary to reduce the total number of journeys to nine. Thus although the journeys were combined the sections still remained the same so that the times and so on of the walking parts were not affected. The only other criteria for combining journeys apart from the fact that they had to have the same purpose was that the combination should not led to more than nine walking sections in the journey.

In other cases where there were more than nine walking sections for a journey the journey was split and made into two, each with nine or fewer walking sections. It was noted whether this led to more than nine journeys for one informant. In cases where it did the previous procedure was also carried out.

The only other adjustment of the journey and section information was the splitting of sections if they went over the specified two hour periods.

As we could not analyse the information minute by minute the day was divided into two hour periods, beginning at midnight the day before and going on to midnight of the sample day (in fact the first two periods 12 — 2am and 2 — 4am were amalgamated because so few people would have been out at that time).

We then wanted to be able to give any results that were given for the sample day for any of these two hour periods. So that, for example, it would be possible to say how many roads were crossed between 4pm and 6pm or how many zebra crossings had been used between 8pm and 10pm. However, this could only be done if each walking section was uniquely defined in one two hour period. Thus when any walking section was found to overlap any two hour period it was divided so that two or more sections were formed each falling into one and only one two hour period. The division of the sections was carried out according to a set of rules.

Where an overlap occurred a new section description sheet was made out and given a new section number and the old one was altered. The times of the end of the walk on the old sheet and the beginning of the walk on the new sheet were set to equal the finishing time of the first two hour period involved. The proportion of the total time allocated to each section could then be calculated and the number of lines completed on the observation sheet and the time taken by the interviewer to rewalk the route were then divided between the two new sections in the same ratio. The time out in the light was recalculated appropriately and all other information was copied from the old sheet onto the new sheet.

In some cases this division may have led to a journey with more than nine sections in which case the previously described procedure was carried out.

Although these three operations may have slightly affected the numbers of journeys they in no way altered the information about the informant's pedestrian exposure.

Thus it can be seen that in attempting to make the pedestrian exposure information as accurate and manageable as possible it has been necessary to sacrifice some of the reliability of the journey information. For this reason no information for journeys is presented in this report.

Appendix E Definition of light and dark

As one of the purposes of collecting data about pedestrian activity was to compare them with the accident statistics the definitions used in the analysis needed to be the same as those used by the police in collecting the accident figures. One particular case is that of light and dark. For accident purposes the hours of darkness are defined to last from half an hour after sunset to half an hour before sunrise thus coinciding with 'lighting-up time'.

The times of sunrise and sunset vary with respect to geographical position and the time of year. As the fieldwork period was spread over eight weeks and the sample covered the whole of England, Wales and Scotland both these variations had to be considered. We found that for some sample areas the 'lighting-up time' changed by more than two hours from the beginning to the end of the fieldwork period and that the variation in geographical position caused differences of over half and hour in the times of sunrise and sunset.

As the variation in the hours of darkness with respect to the time of year were so large the classification of journeys according to whether they were made in the hours of light or darkness had to be carried out for each day of the fieldwork separately. However the variation with respect to geographical position is much smaller so rather than treating each of the districts selected in the study individually they were grouped on a geographical basis into fifteen large areas. 'Lighting-up times' were then ascertained for each data of the fieldwork within each of these areas.

Six of the area groups were formed around six major cities: Birmingham, Bristol, Glasgow, London, Manchester and Newcastle. The times of sunrise and sunset for these cities are readily available in published material. However this is not so for the other nine areas which had been formed. For these cases we picked a central point in each area and HM Nautical Almanac Office very kindly supplied us with the relevant data. All the times used were British Summer Time.

Using these figures the time the informant had spent walking could be allotted, as appropriate, to the hours of daylight or darkness.

Appendix F Use of the accident figures and calculation of casualty rates

The fieldwork for this survey took place in September and October of 1975 running from 1st September to 25th October, the last day of British Summer Time. As the accident figures are known to vary throughout the year we needed the data regarding pedestrian accidents to be for the same time of year as the fieldwork and this was arranged with the Transport and Road Research Laboratory. The basic unit used in the analysis was one day and to ensure that there was an even distribution of days of the week in the sample each selected person was allotted a preselected sample day. Thus regardless of the day of the week on which the interview took place each informant had to be asked about their own preselected day of the week. This meant it was possible to add together all the information (correctly weighted) and divide by the total sample to get results for an 'average' day of the week.

However, the accident figures were, of course, dependant on the distribution of days during the field period and September 1st 1975 was on Monday and October 25th was a Saturday which meant Sundays were under represented in the accident figures compared with the survey exposure figures. We thus had 55 days of accident figures when, for an equal distribution of days we should have had 56. Since it is known that there are only about half as many casualties on a Sunday as on other days of the week, division of the total number of casualties by 55 would have given too high an estimate of the number of casualties on an 'average' day, while division by 56 would have produced too low an estimate. As the accident figures for people of different ages and sexes were available by day of the week it was possible to estimate the number of casualties for a Sunday for these groups and to add this to the total figure. This enabled the number of casualties for an 'average day' to be calculated from the estimated total divided by 56. However, this was not possible for any other sub-groups. For these cases (such as the division of casualties by class of road) we estimated the values for an 'average day' to be half the sum of the number of casualties divided by 55 and the number of casualties divided by 56.

Estimated number of casualties for an 'average day'

$$\left(\frac{\text{Total}}{56} + \frac{\text{Total}}{55}\right)$$

Using the number of casualties for an 'average' day the daily casualty rates quoted in the text were calculated as follows:

i) Population casualty rate

$$= \frac{\text{No. of casualties for average day x 100,000}}{\text{No. of people in population}}$$

ii) Casualty rate for people who could go out on foot

$$= \frac{\text{No. of casualties for average day x 100,000}}{\text{No. of people in population x proportion who could go out on foot}}$$

iii) Casualty rate for people out walking on an 'average' day

$$= \frac{\text{No. of casualties for average day x 100,000}}{\text{No. of people in population x proportion who did some walking on their sample day}}$$

iv) Casualty rate per million roads crossed etc

$$= \frac{\text{No. of casualties for average day x appropriate factor}}{\text{No. of people in population x mean no. of roads crossed etc.}}$$

Table F.1 Population figures used in casualty rate calculations taken from 1975 mid-year estimates (000's)

Age	Male	Female	All persons
18-29	4744.2	4615.4	9359.6
30-39	3310.5	3222.4	6532.9
40-49	3144.9	3138.7	6283.6
50-59	3111.5	3295.1	6406.6
60-69	2688.6	3184.7	5873.3
70-79	1363.7	2213.7	3577.4
80 and over	367.5	943.6	1311.1
All ages	18730.9	20613.6	39344.5

Appendix G The questionnaires

SS 1066 Pedestrian Habits

OBSERVATION SHEET

Name ----------------------------------

Time interviewer started walk --------

Area No. ☐☐☐ Serial No. ☐☐☐ Jrny. No. ☐ Section No. ☐

	(a)	(b)		(c)								Part to be crossed														(j)		(k)
				IF 1ST LETTER AT (b) IS 'P' OR 'V' Is there a junction at departure?				IF 2ND LETTER AT (b) IS 'P' OR 'V' Is there a junction at arrival?				(d) Did the pedestrian turn to cross?			(e) Pedestrian facility		Traffic lights			(f) Traffic flow			(g) Can traffic turn from behind across the pedestrian as he steps into road?		(h)	IF (c)=1-4	LOOK	
	Line No.	Safe Points (P,V,R) From	To	Yes at Jct	±20 Yds	Not	DNA	Yes at Jct	±20 Yds	Not	DNA	T.Left	T.Right	Did not turn	Zebra	Pelican	🚶	0-0-0	None	Two way	One way from		Yes	No	Class of road crossed	Class of other road		Paces
				1	2	5	X	3	4	6	X	L	R	F	1	2	3	4	5	T	L	R	8	9	A B C	A B C X	BEFORE	
				1	2	5	X	3	4	6	X	L	R	F	1	2	3	4	5	T	L	R	8	9	A B C	A B C X		
				1	2	5	X	3	4	6	X	L	R	F	1	2	3	4	5	T	L	R	8	9	A B C	A B C X		
				1	2	5	X	3	4	6	X	L	R	F	1	2	3	4	5	T	L	R	8	9	A B C	A B C X	YOU	
				1	2	5	X	3	4	6	X	L	R	F	1	2	3	4	5	T	L	R	B	9	A B C	A B C X	CROSS	
				1	2	5	X	3	4	6	X	L	R	F	1	2	3	4	5	T	L	R	8	9	A B C	A B C X		
				1	2	5	X	3	4	6	X	L	R	F	1	2	3	4	5	T	L	R	8	9	A B C	A B C X		
				1	2	5	X	3	4	6	X	L	R	F	1	2	3	4	5	T	L	R	8	9	A B C	A B C X		

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Time interviewer finished walk ---------------

Number of minutes ---------------

Interviewer Name -----------------

No. -----------------

Sheet no. ☐

SS1066 Pedestrian Habits

INTERVIEWER CHECKING

SECTIONS ON FOOT ALONG ROADS
DESCRIPTION SHEET

No. of lines			Mins

Name ....

REFER TO RELEVANT WALKING SECTION

Area No.			Serial No.			Jrny No.	Section No.

(a) Time of day	(b) Time taken	OFFICE USE	(c) Were you walking in a built-up area or not?			(d) Was there a pavement where you were walking or not?		
Start ----------	(Minutes)		Yes	No	Mixed	Yes	No	Mixed
get there ----------			1	2	3	4	5	6

(f) We'd like to know whether pedestrians are out by themselves or not. When you walked from ___ to___....(i)-(iv)	(i)..did you have a dog with you?..	(ii).. did you have a child with you?...	(iii)...were you with an adult?...	(iv)...or were you by yourself?
all of time	1	4	1	4
some of time	2	5	2	5
No; none of time	3	6	3	6

(g) The people whose job it is to make the roads safer for everyone need to know how many roads and what kind of roads pedestrians cross. So could you please describe to me, in detail, just where you walked when you went from __ to ___ telling me what direction you took, what side of the road you were on, where you turned right or left, where you crossed the road and whether you crossed at a zebra crossing or traffic lights. Please tell me the names of the streets if you can and any landmarks such as shops, churches, parks and so on.

Interviewer name .... Int.No. .... CONTINUE OVERLEAF IF NECESSARY

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SS1066

Pedestrian Habits

INTERVIEW QUESTIONNAIRE - EVEN NUMBERS

Area No. ☐☐☐ Serial No. ☐☐☐ 2

Interviewer's name .... Name ....

Interviewer's number ....

Date of interview .... Sample day date ....

1 CONTACT

Eligible person interviewed 1
Moved, non-contact or refusal . ...2 see (a)
Emigrated, dead 3

(a) IF MOVED, NON-CONTACT OR REFUSAL (2)

PLEASE TRY TO ESTABLISH THE ANSWERS TO Q1(b) AND Q2
IF MOVED PLEASE ALSO FIND OUT NEW ADDRESS AND RETURN DOCUMENTS FOR REALLOCATION IF NECESSARY

(b) FIND OUT OR ESTIMATE IF NECESSARY

Informant been out in last month 1
Not 2

2 The amount people get out and about as pedestrians may be affected by things such as their age, the transport available and their health.

(a)

(i) Age last b'day	(ii) Sex		(iii) Marital status			(iv) Employment status			(v) Dog in household		(vi) Car (or van) in hhld	
	M	F	M	S	W	Full	Part	Not	Yes	No	Yes	No
	1	2	1	2	3	1	2	3	1	2	1	2

(b) Do you hold a full current driving licence?

Yes, full licence 1
No ....A ask (c)

(c) IF NO (A)

Have you ever held a full driving licence?

Yes, have held 2
Not 3

-1-

Now we turn to health

3 (a) Do you have .... INDIVIDUAL PROMPT

...any problems with your eyesight? ..	Yes	No	
...any problems with your eyesight? ..	..1	X	
any problems with your hearing? ...	..2	X	
any difficulties with walking?	..3	X	
or any other health problems?	..4	X	ask (b)

(b) IF OTHER HEALTH PROBLEMS (4)

What kind of health problems?

(c) IF YES TO ANY OF Q3(a) CODES (1-4)

Does your_____ limit the amount you get out and about or not?

Yes, limits. ...1
Not 2

4 (a) (Could I just check) Have you been out at all (beyond the house and garden) today?

Yes, today ....1 ask (e)
No ....B ask (b)
(SPONTANEOUS) Never goes out . ...5 go to Q7

(b) IF NO (B)

Did you go out at all yesterday?

Yes, yesterday ... ...2 ask (e)
No ....C ask (c)

(c) IF NO (C)

Have you been out at all in the last week?

Yes, week ....3 ask (e)
No ....D ask (d)

(d) IF NO (D)

Do you ever get now or not?

Yes, sometimes ....4 ask (e)
(INCLUDE TEMPORARY ILLNESS OR DISABILITY)
Never goes out ....5 go to Q7

(e) IF GOES OUT CODES (1-4)

(Can I just check) Some people can't get about very well on foot. Can you get out on foot, or can you only go out when you are driven from door to door?

Yes, on foot 1
Only when driven .. ...2 go to Q7

-2-

IF GOES OUT ON FOOT Q4 CODE (6) OTHERS GO TO Q7

5 When you are walking by yourself along a pavement would you say that you walk ...

RUNNING PROMPT

...faster than other people 1
about the same 2
or slower than other people? 3

RECORD QUALIFICATIONS

6 (a) Crossing the road may be difficult for some people but not so difficult for others. Do you yourself have any particular difficulties with crossing the road or not?

Yes (sometimes) .. ...1 ask (b)
No 2

(b) IF YES (1)

(When you have difficulties) what makes it difficult?

TO ALL

Roads are, of course, used by both drivers and pedestrians and different kinds of road users may annoy others without really meaning to.

7 What kinds of things do you think drivers do that annoy pedestrians?

8 What kinds of things do you think pedestrians do that annoy drivers?

9 (a) What (other) kinds of things do you think make roads dangerous for pedestrians?

(b) Thinking of the roads that you know, which do you consider is the worst danger spot for pedestrians?

(c) What makes that place particularly dangerous (for pedestrians)?

10 INTERVIEWER

IF PERSON DOES NOT GO OUT ON FOOT (Q4 CODE 5 OR 7) END INTERVIEW

OTHERWISE CONTINUE WITH Q11

11 We've been talking about pedestrian problems in general and now I would like to ask about the times you yourself have been out.

We have to make sure that the different days of the week are equally covered among the people in the survey so I'd like to ask you about ___ day, that is ...

... yesterday
the day before yesterday
last ___day

RING SAMPLE DAY

Monday ...	1
Tuesday ..	2
Wednesday ·	3
Thursday .	4
Friday ...	5
Saturday .	6
Sunday ...	7

I'd like to talk to you about all the times you went out beyond the house and garden on ___day.
The outings people make may be big or small and we're interested in all of them even the very short trips.
We want to include when when you went out on foot or by car or train or any other form of transport.

So could we talk about ___day?

ESTABLISHING JOURNEYS

(a) Firstly, can I check, were you out at all on the previous night, that is ___day night, after midnight?
IF YES DEAL WITH THIS JOURNEY AND THEN SEE (b)
IF NO SEE (b)

(b) Were you out at all before six o'clock on ___morning?
IF YES DEAL WITH THIS JOURNEY, CHECK REST OF TIME PERIOD AND THEN SEE (c)
IF NO SEE (c)

(c) Did you go out at all before eight o'clock?
AS (b) AND THEN SEE (d)

(d) Did you go out at all in the morning between eight o'clock and twelve o'clock?
IF YES DEAL WITH FIRST JOURNEY IN THIS PERIOD
THEN CONTINUE WITH SUBSEQUENT JOURNEYS IN THIS PERIOD
THEN CHECK THE REST OF THE TIME PERIOD
AND THEN SEE (e)
IF NO SEE (e)

(e) Did you go out at all in the middle of the day, that is between twelve and two?
AS (d) AND THEN SEE (f)

(f) Did you go out at all in the afternoon between two and six?
AS (d) AND THEN SEE (g)

(g) Did you go out at all during the evening?
AS (d), CHECK WHETHER ANY EARLIER JOURNEYS NOW REMEMBERED

INTERVIEWER FOR INFORMATION

12 hr. clock	24 hr. clock
12.00am	0.00
1.00am	1.00
2.00am	2.00
3.00am	3.00
4.00am	4.00
5.00am	5.00
6.00am	6.00
7.00am	7.00
8.00am	8.00
9.00am	9.00
10.00am	10.00
11.00am	11.00
12.00pm	12.00
1.00pm	13.00
2.00pm	14.00
3.00pm	15.00
4.00pm	16.00
5.00pm	17.00
6.00pm	18.00
7.00pm	19.00
8.00pm	20.00
9.00pm	21.00
10.00pm	22.00
11.00pm	23.00
12.00pm	24.00

WHEN ALL JOURNEYS DEALT WITH GO ON TO WALKING SECTIONS

OFFICE USE	J1	J2	J3	J4	J5	J6	J7	J8	J9	Total no. of journeys
Purpose										
Transport										
No. of sections on foot										

JOURNEY DETAILS
(SEE INSTRUCTIONS FOR DETAILED DEFINITIONS)

INTERVIEWER CHECKING

No of code 'I's at (v)

(ii) Could you tell me where you started from, where you went to and what the purpose of the journey was?
CHECK Did you go anywhere else on the way?

(iii) What time did you start out?
What time did you get there?

(iv) What kind of transport did you use, or was it all on foot?

(v) DIVIDE JOURNEY INTO SECTIONS
AND THEN GO ON TO ESTABLISH NEXT JOURNEY

(i) Jrny No.	(ii) Description and main purpose	(iii) What time did the journey..	(iv) transport used (include foot)	(v) INTERVIEWER DIVIDE JOURNEYS INTO SECTIONS (SEE INSTRUCTIONS)			
				Sct No.	Description (From__to__)	On foot along roads	Not
	From	Start				1	2
	To					1	2
	Purpose	End				1	2
						1	2
						1	2
	From	Start				1	2
	To					1	2
	Purpose	End				1	2
						1	2
						1	2
	From	Start				1	2
	To					1	2
	Purpose	End				1	2
						1	2
						1	2

CONTINUE ON PAGE 8

(i) Jrny No.	(ii) Description and main purpose	(iii) What time did the journey..	(iv) transport used (include foot)	(v) INTERVIEWER DIVIDE JOURNEYS INTO SECTIONS (SEE INSTRUCTIONS)			
				Sct No.	Description (From__to__)	On foot along roads	Not
	From	Start				1	2
	To					1	2
	Purpose	End				1	2
						1	2
						1	2
	From	Start				1	2
	To					1	2
	Purpose	End				1	2
						1	2
						1	2
	From	Start				1	2
	To					1	2
	Purpose	End				1	2
						1	2
						1	2
	From	Start				1	2
	To					1	2
	Purpose	End				1	2
						1	2
						1	2

CONTINUE ON PAGE 9

(i) Jrny No.	(ii) Description and main purpose	(iii) What time did the journey..	(iv) transport used (include foot)	(v) INTERVIEWER DIVIDE JOURNEYS INTO SECTIONS (SEE INSTRUCTIONS)			
				Sct No.	Description (From__to__)	On foot along roads	Not
	From	Start				1	2
	To					1	2
	Purpose	End				1	2
						1	2
						1	2
	From	Start				1	2
	To					1	2
	Purpose	End				1	2
						1	2
						1	2
	From	Start				1	2
	To					1	2
	Purpose	End				1	2
						1	2
						1	2
	From	Start				1	2
	To					1	2
	Purpose	End				1	2
						1	2
						1	2

(We've been talking in a lot of detail about just one day) now I'd like to talk generally about you as a pedestrian.

12 People sometimes cross the road diagonally, and at other times they cross straight over. Would you say that you cross diagonally ...

RUNNING PROMPT

...very often 1
fairly often 2
not very often 3
or not at all? 4

---

13 (a) Would you describe yourself when crossing the road as ...

RUNNING PROMPT

...very cautious ....1 } ask (b)
rather cautious .. ...2 } ask (b)
average 3
rather rash ....4 } ask (c)
very rash? ....5 } ask (c)

(b) IF CAUTIOUS (1-2)

In what ways would you say you are rather/very cautious?

(c) IF RASH (4-5)

In what ways would you say you are rather/very rash?

There are several different types of pedestrian crossing nowadays, one of which is the zebra crossing

14 When you are walking along on your own would you describe yourself as someone who ...

RUNNING PROMPT	...goes out of their way to use a zebra .	...1
	or tends not to cross at a zebra?	...2
	Other (SPECIFY) .,....................	...3

We'd like to ask you what you think are the good points and bad points about zebra crossings.

15 From the pedestrian's point of view what do you think are the good things, if any, about zebra crossings?

None 1

---

16 (From the pedestrian's point of view) what do you think are the bad things, if any, about zebra crossings?

None 1

A fairly new kind of pedestrian crossing is called a pelican. There are more of them in some areas than others.

17 (a) Have you ever seen that kind of crossing?

Yes, seen ...	....B	ask (b)
Not	1	go to Q22

(b) IF SEEN (B)

Have you, as a pedestrian, ever used a crossing like this?

Yes, used ...	2	ask Q18-Q21
Not	3	

IF SEEN OR USED PELICAN Q17 CODES (2-3) OTHERS GO TO Q22 page 14

18 From the pedestrian's point of view what do you think are the good things, if any, about pelican crossings?

None 1

---

19 (From the pedestrian's point of view) what do you think are the bad things, if any, about pelican crossings?

None 1

20 (a) Comparing zebra and pelican crossings which do you prefer, as a pedestrian?

Zebra ....1 } ask (b)
Pelican ....2 } ask (b)
No preference 3

(b) IF ZEBRA (1) OR PELICAN (2)

Why do you prefer ____?

21 When a pedestrian is at a pelican crossing he will see a red man, a green man or a flashing green man. SHOW CARD

(a) What does the red man mean?

(b) What does the green man mean?

(c) What does the flashing green man mean?

TO ALL

We've been talking about things that make crossing the road safer but unfortunately some pedestrians are still involved in accidents.

22 (a) Have you as an adult ever been knocked down by a vehicle?

Yes .. ....1 ask (c-e)
No ... .B ask (b)

(b) Have you ever felt that you were quite near to being knocked down?

Yes, near .. ....2 ask (c-e)
Not 3

IF YES (1) OR (2)

(c) About how long ago was that (the last time)?

PROMPT IF NECESSARY

In the last six months 1
More than six months up to a year 2
More than a year up to 2 years 3
More than 2 years ago 4

(d) What were you doing?

(e) What was the vehicle doing?

23 (a) Comparing nowadays with five years ago do you find that for you crossing the road is generally easier, about the same, or harder now, than it was five years ago?

Easier now ....1 ask (b)
The same 2
Harder now ....3 ask (b)

(b) IF EASIER (1) OR HARDER (3)

In what ways is it ______?

---

24 Are there any other comments that you would like to make about being a pedestrian?

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